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THE ELECTRICAL REVIEW

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THE TELEGRAPHIC JOURNAL AND
Electrical Review.
Vol. XII.—No. 268.

ELECTRICITY *v.* GAS.

Amongst the great arguments in favour of the electric light are those of the absence of noxious vapours, its cleanliness, and other matters of a like character. All such facts as these are admitted, we believe, by its greatest opponents, but we should not be surprised that the *bad* effects of gas, its opponent, will be made more apparent during the course of the Electrical Exhibition at the Crystal Palace than even the adherents of the electric light had anticipated. We hear that a considerable amount of damage has already been done to the plants in the Palace, and that the closing of the gas exhibition is seriously contemplated. This we give for what it is worth—it may or may not be true; we hope the latter is the more correct, as it would be a serious loss to all interested in lighting improvements should this interesting collection of gas apparatus be prematurely withdrawn. Such a course, should it be necessary, would be the more regrettable seeing that the electric lighting part of the exhibition is in such a backward state. No doubt a considerable amount of information has already been obtained as to what effect such a voluminous display of gas lighting has had upon the artistic belongings of the Crystal Palace, and it will be most interesting to learn the result; for upon it will probably hang a very important argument as to the most effective manner of lighting large spaces when the matter of health and cleanliness enters into the question.

The subject of the comparative cost of the two illuminants has been discussed over and over again; and we have in our pages from time to time shown that even in isolated installations gas, used in a gas-engine for producing motive-power would give more light when converted into electrical energy than by using it directly as a lighting medium. Therefore the argument of those who are connected with gas interests, that even should the electric light be available to householders at the present rate of gas, then the gas companies could lower their prices to a considerable extent and yet make a good profit, is really a point in favour of the electric light, for if we can get gas at a cheaper rate than it is now supplied for, we could reduce in proportion the price of the electric light, using the gas for motive-power. We do not, however, suppose that any householders, other than those possessing a large income, would care to encumber themselves with an electric lighting plant for private use, as the first cost would be too heavy, but we have merely mentioned here what we have already said before, that even for isolated installations electric lighting is preferable to that of gas, which fact was very conclusively proved last year by Mr. Crookes, F.R.S.

The Electric Lighting Committee appointed by the Newington Vestry has decided to recommend the vestry, at their next meeting, to borrow £20,000 to carry out experiments in lighting a portion of the parish with the electric light. As Newington is the only parish in London which has decided to undertake the entire responsibility of taking up the Act, indignation meetings have been held in the parish.

BENNETT'S TELEPHONIC TRANSLATORS.

One of the results of the memorable test action by the Postmaster-General against the United Telephone Company was that, although the Government ultimately agreed to grant licences to the various telephone companies to open exchanges in most of the important towns of the United Kingdom, and to connect therewith subscribers within distances varying from three to five miles of their exchanges, the companies were positively forbidden to join their systems in different towns, however desirable it might be in the interests of the commercial community that such a connection should be established.

As an illustration may be cited the exchanges opened by the National Telephone Company in Glasgow, Paisley, Greenock, Dumbarton, Coatbridge, and Hamilton. The business relations between these towns are of the most intimate character, it being not uncommon for one firm to possess branches, works, or offices in two or more of them, and daily customers in all, and yet the company was not allowed to provide anything but local exchange communication.

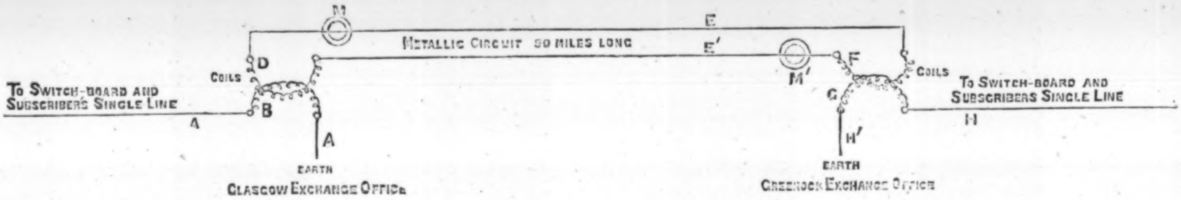
After much negotiation, the Post-office agreed to erect trunk wires on their own poles between the various exchanges, stipulating that a separate trunk wire should be provided for every eight subscribers desiring to avail themselves of the privilege, and that for every wire the company should pay the Government an annual rental of £320 between Glasgow and Greenock; £104 between Glasgow and Paisley; £128 between Glasgow and Hamilton, and £120 between Glasgow and Coatbridge. Subsequently a trunk wire between Glasgow and Edinburgh was projected, and the Government tax was fixed at £560 per annum. Similar arrangements were made for Bradford, Leeds, Huddersfield, Birmingham, Wolverhampton, and other important towns, and notwithstanding the heavy rates that the Government tax rendered necessary, amounting, in the case of Edinburgh, to no less than £110 per annum for each subscriber, the most prominent merchants quickly took advantage of the opportunity of obtaining free communication with their distant customers. But now arose a difficulty which appears to have been entirely overlooked by the Post-office electricians and by the non-technical officials of the National Telephone Company, by whom the negotiations were conducted. Being erected on the same poles as the ordinary telegraph wires, the new trunk lines would obviously be greatly affected by induction. This was recognised, and it was agreed to run metallic circuits on the principle first suggested, we believe, by Professor Hughes, and first practically given effect to by Messrs. Moseley, of Manchester. This plan was, of course, known to be effectual in neutralising the effects of induction from neighbouring telegraph wires, but until the contract with the Post-office had been concluded, or nearly so, no person had considered how the extremities of the metallic loops forming the trunk lines were to be joined to the subscribers' single local wires. Putting the metallic loop to earth anywhere would certainly destroy the balance and render the induction as audible as on an ordinary single wire, while it was quite impossible, on the score of expense, to run metallic loops for the local subscribers, as that would be practically doubling the company's already crowded systems. When the terms of the contract came to the knowledge of Mr. A. R. Bennett, Engineer to Messrs. D. and G. Graham, the National Telephone Company's engineers and contractors for the West of Scotland, he warned the company of the dilemma they had placed themselves in, and was thereupon requested to devise a means of overcoming the difficulty. In May, 1881, Mr. Bennett began to experiment, and, after trying several plans, patented, in October, 1881, the only one which proved successful. This consists of a system of induction coils of peculiar construction, arranged to translate the telephonic pulsations to and from the metallic loop without putting it to earth at any point. Having induced currents of small quantity to deal with it was obvious that coils having primaries of the usual thick wire and small resistance would not answer. Coils with primaries and secondaries of equal gauge and resistance were therefore tried, but subsequently it was proved that the best results were obtained from coils having a resistance ratio of 1 to 2·6. The mode of connecting the translators will be clearly understood from the following figure:—

That is to say, one of the helices of the translator at the Glasgow Exchange is connected by means of the metallic trunk loop, which in this case has a total length of 50 miles, with one of the helices of the translator at the Greenock Exchange. When a Glasgow subscriber wishes to speak to a Greenock subscriber their respective single wires are connected to earth through the switch-boards and the disengaged helices of the translator. The speaking is then transmitted in the following manner:—

(1) The current arriving at the Glasgow Exchange from the first subscriber's wire, A, passes through the helix, B, of the translator and A^1 to earth; and

(2) Induces in the other helix, D, of the translator similar currents, which pass over the wire, E, of the metallic loop, through the helix, F, of the Greenock translator, and back to Glasgow by the return wire, E^1, of the loop; and

(3) Induces similar currents in the other helix, G, of the Greenock translator, which pass away to the second subscriber's single wire, H, and to earth through his telephone, the other end of the helix, G, being connected to earth through the wire, H^1.


M
E
METALLIC CIRCUIT 50 MILES LONG
E′
D
COILS
M′
F
COILS
TO SWITCH-BOARD AND SUBSCRIBERS SINGLE LINE
B
A
A
EARTH
GLASGOW EXCHANGE OFFICE
G
TO SWITCH-BOARD AND SUBSCRIBERS SINGLE LINE
H
H′
EARTH
GREENOCK EXCHANGE OFFICE

M and M^1 are magneto-electric calls and bells inserted one in each wire of the metallic loop for the purpose of enabling the exchanges to call each other's attention.

Although some diminution in the loudness of the speaking results from the double transfer by induction to and from the metallic loop, this can be compensated for by speaking closer to the transmitter, or more carefully than is usual on local lines, or by using two or more cells joined for quantity on the transmitter instead of the ordinary single cell.

In the Glasgow district the invention, which is now the property of the Electromotive Force Company, Limited, has been working successfully for about nine months, and for a shorter period in Yorkshire, Staffordshire, and Warwickshire. As telephonic inter-communication between town and town becomes more common its sphere of usefulness will doubtless extend. Curious points about this apparatus are that the current is changed no less than four times between the speaker's transmitter and the listener's telephone, and this induction is successfully used in one form to combat the mischievous effects of the same phenomenon in another.

ON EXPERIMENTS IN ELECTRIC LIGHTING IN THE STREETS OF BERLIN.

By VON HEFNER-ALTENECK.

(*Continued from page* 7.)

THE construction of the cables is of some interest. The core consists of a massive copper wire of 3·4 mm. in diameter. It is spun round with jute saturated with a resinous mass according to a process patented by Siemens and Halske, then folded up in lead in a press, the construction of which is likewise the property of the above firm, and finally covered with another coating of tarred jute. These cables are distinguished by their good insulation, their resistance to mechanical influences and to changes of temperature, and above all by their cheapness. As they will probably be found very permanent this method of producing cables will become very important in view of the high price of gutta-percha.

The following numerical facts must be given. The weight of the dynamo-electric machines is 800 kilos. each, the total resistance of their coils is 14·3 ohms. They yield a current of 11 ampères with the tension difference of about 650 volts and an electromotive force of 800 volts. The length of the three circuits is respectively 1974, 1887, and 1480 metres; their resistance is 2·25 ohms per kilometre. The carbon rods in the lamps are 11 mm. in diameter, and a pair of carbons last 9 hours. An increased duration would be useless as the lamps burn only till midnight and are cleaned daily. The resistance of an arc is about 4·5 ohms; the illuminating power through the ground glasses with which the lamps are fitted and at an angle of 30° with the horizon = 880 normal candles.

The gas-consumption, which is checked officially by accurate meters, is, for each gas-engine (*i.e.* for 12 lamps), on an average 11·5 cubic metres per hour, including the seven burners used to light up the engine house. If this quantity of gas was burnt in ordinary street-lamps instead of being used to produce working-power and electricity, only about one-tenth part of the illumination would be obtained which is produced by the electric light.

I can confirm that hitherto the arrangement has never failed to act. In order that dissatisfied newspaper communications may not be urged against me I will mention that in the evening when the whole is set in action it generally takes some minutes before all the lamps begin to burn, some of them remaining behind. The lighting up is, indeed, a critical point. This depends simply on the special nature of the plant. At the outset, when all the carbon rods are in contact and are cold and the machines require an intensified force, this cannot be obtained by the gas-engines. The worst thing that ever happened during lighting up was the slipping of a driving-band, which occasioned a delay of twelve minutes, affecting the 12 lamps of one circuit.

In consideration of these circumstances the lamps are now always ignited a few minutes before the stipulated time, and when once in action not one of them has failed even temporarily. Hence the penalty of 4-10ths of a shilling for each lamp which should fail to burn for more than 30 minutes has never been incurred.

I will not lay too much weight upon these facts, for why should not irregularities occasionally happen? We must consider that the whole arrangement has the character of an experiment to last for a year, and though all the parts of the apparatus are well made various novelties have been introduced in the hope of gaining experience. Thus the construction of the cables is quite novel, and if we consider the high tension which it has to resist, its insulating power is being submitted to a severe test.

Above all, the arrangements must be viewed as experimental as regards the use of gas-engines to drive the electric machines. This feature was especially demanded by the authorities, with a view to ascertain the gas consumption, and has never yet been attempted on such a scale. For the work of a single winter month, about three million gas explosions are required, each of which has to be effected by a constantly recurring, but not quite simple process. I take this opportunity of thanking beforehand the inventor of these gas-engines, if we effect the 25 million explosions needed for a year's work without a failure. Any such failure would occasion a distinct fluctuation of the light. Should the igniting-flame (of the gas-engine) go out, the 12 lamps affected would remain dark till the reserve engine was set in action and connected, which would require a few minutes.

Above all, I would beg the representatives of the press to consider these points in their reports, and not in case of a few minutes' delay in getting the lamps into full action, to speak of the electric light as in danger of losing its popularity.

The lamps in the Leipziger Strasse are worked by constant continuous currents, whilst hitherto Siemens and Halske have utilised machines with alternating currents for lighting on the large scale. It may be taken for granted that they have had their reasons for so doing, the more as they at first put up constant current machines on different designs, and used them for divided lights at the Exhibitions of Halle in 1880, and of Paris in 1881. The first of these sets of apparatus is still in action in the brewery of Mr. Rauchfuss, and I have been repeatedly assured that it was the first plant which had given satisfaction. The difference between constant current and alternating current lights has been exaggerated. The Siemens and Halske differential lamp is sometimes even simply called the alternating current lamp, whilst the difference lies merely in the machine selected.

I have stated formerly that Siemens and Halske have been induced to prefer the alternating current machines from greater confidence in the certainty of their action. In order to prepare the ground for the adoption and the development of the electric light it was, above all things, needful to remove any distrust in its certainty. Hence the question of a greater or less luminous effect became merely secondary. I can say to-day that the confidence in our alternating-current machines has been splendidly justified by the result, for such have been in action for three and four years without requiring the outlay of a penny for repairs.

Wherein lay the grounds for a doubt in the certainty of the constant current machines? To answer this question a digression must be permitted.

Besides the action of the production of sparks at the commutator, which has already been mentioned and which can be substantially overcome by a proper arrangement and by filling up the intervals with an incombustible mass, it has been found that electric currents, even in the form in which they occur in the wires of the armature in machines like those of Gramme, or of Siemens and Halske, are capable of breaking the wires.

I will mention only briefly the details of the circumstances under which this phenomenon, scientifically interesting, but practically unpleasant, is apt to occur. It is evidently due to a molecular action of the current not yet understood. Opportunity will be found in future to make known the results of the laborious and costly experiments which have been made for its investigation in the works of Siemens and Halske, and which are not yet completed.

The rupture of the wires is probably due to the very violent induction currents or electric shocks which arise in each part of the wires in the moment when the current is suddenly inverted. It occurs therefore only in machines of very high tension in which this internal action is very strong. On the other hand, the danger of breaking does not depend on the degree in which the wires are used by the current permanently produced in them and conveyed outwards. This demand is much greater in machines of low tension (*e.g.*, for a single light) in which a rupture of the wires has never been observed.

The fracture always occurs at a certain point, at the ends of the several groups of wires where the brushes leave them. The two broken ends remain in contact, and if the machine is at once stopped the cotton or silk coating is not injured. A molecular change in the wire has not been certainly demonstrated The phenomenon occurs in general when the machine has been running for some time, and it is apt to recur after the repair of the first fracture. The details of the arrangement of the commutators seem to be not without influence upon this danger, but nothing certain has been hitherto effected by a division of the commutator.

The best, though costly, means to obviate this danger appears to be an increase of the size of the machine for a given power, the use of a thicker wire upon the armature and an increase of the quantity of wire upon its sections. The machines for the lights in the Leipziger Strasse have been made of double the weight of a machine of the same power which showed a disposition to the rupture of the wires.

I would not wish to be understood as implying that constant current machines of high tension—and only such come here into question—are unsafe. Various types of such machines, which I consider quite safe, are sent out by the firm. It is difficult to solve a question, which greatly affects the point of expense, how large a machine for divided lights must be to ensure perfect safety, especially as the fault in question may not appear until after prolonged working.

It has occurred that a new machine has been tested for months at the works of Siemens and Halske, and has proved good both then and subsequently, and yet in a second machine, built exactly on the same pattern, a fracture has taken place.

Perhaps these statements may lead to the publication of observations which will have doubtless been made elsewhere on this difficulty, which would be very desirable.

The above-mentioned facts prove plainly that temporary experiments with dynamo machines, in which the most important questions of their durability do not come to light, can form no basis for a decision as to their value. We have been attacked from many sides because at the Munich Exhibition we did not offer our machines and apparatus for the experiments there performed.

Permit me to take the opportunity of replying that such tests would be worthless to us. We know the properties of our machines from hundredfold determinations.

If any one wishes to know our methods, or to test their accuracy, whether as a customer or as a scientific inquirer, or even as a rival, he will be welcome. He is courteously invited, and nothing will be concealed from him.

I would, however, remind the gentleman who, concerning the publications of the Exhibition Committee, alleges as a "characteristic fact" that Siemens and Halske alone discountenanced the "scientific examination" of their apparatus and performances," that this firm is the only one which has been the birthplace of measurements of dynamo-electric machines, and has originated the instruments which have rendered the exact measurement of such machines possible, both as regards their electric capabilities and the motive power which they require.

I return to the lighting of the Leipziger Strasse, and I will compare the cost with that of the neighbouring gas-lighting arrangements. Reckoning from the crossing of the Leipziger and Friedrichs Strasse, the former is lighted for a certain distance with Fritz Siemens' "regenerative burners" of 120 normal candle-power, and consuming hourly 80 litres of gas. The Friedrichs Strasse, southwards, is lighted with Lacarrière's "ring burners" (105 candles, 120 litres), and northwards with Bray's "three-flame burners" (105 candles, 120 litres). Siemens and Halske have undertaken the electric lighting for a year—*i.e.*, 1,900½ hours for 26,040 marks, = 38-100ths of a shilling hourly.

Considering the different intervals of the lamps from each other at the side streets, &c., the average distances cannot be given exactly. I believe I am right in assuming that the gas lamps stand three times as close together as the electric lights.

If we take the area illuminated by one electric light, or by three gas-lamps as unity, and if we take the price of gas as $\frac{13\cdot3}{100}$th of a shilling per cubic metre (which is what Siemens and Halske pay for the gas consumed in their gas-engines) the illumination of this area costs hourly :—

With regenerative burners	0·32	shillings
With Lacarrière's burners	0·48	„
With Bray's burners	0·48	„
Electric	0·38	„

The strength of light incident upon an equal area amounts with gas-lights to 360, 315, 315 normal candles, but with electric lamps to 880 candles. For an exact comparison the measurements for the electric lights at different angles must be taken into consideration, but the above figure (880), which is measured at an angle of 30° to the horizon, will probably give the mean illuminating power. The electric illumination is hence about 2½ times as strong as the neighbouring powerful gas illumination, which agrees with the general impressions of spectators.

The above figures have been kindly furnished by the Director of the Public Lighting Department. They refer to measurements executed in the photometric room. In how far the difference when burning in the street, the cost of earlier lighting the "regenerative burners," the cleaning and otherwise attending to them and to the lamps must increase the above costs of gas lighting, must be left to specialists.

The price of the gas as $\frac{13}{100}$ shillings per cubic metre is approximately the prime cost. The figures for the electric light is that at which Siemens and Halske supply it. It may be objected that the above firm—like, in my opinion, the Jablochkoff Company at Paris—might consider it their interest to furnish the light for the Leipziger Strasse *below* the cost of production.

I can positively affirm that such is not the case. On the contrary, it is quite certain that by using ordinary steam-engines in place of gas-engines the light may be produced decidedly cheaper, even including the first outlay and the interest.

The electric light, therefore, is not merely a powerful source of light regardless of cost, but it is an eminently economical system of lighting. This fact is placed beyond doubt of many other sets of plant which have been at work for years.

It remains to say a word concerning the much-discussed white or even blue colour of the arc-light. Firstly, this supposed colour does not exist; the electric arc light is, in comparison with daylight, intensely yellow, as any one may convince himself by the photometer, or by merely examining the light in the daytime. That it seems to us white or blue in the evening is merely a subjective phenomenon, since we have been accustomed from childhood to pass the evenings in deeply yellow light and are no longer conscious of it. The eye perceives not colours, but merely differences of colours. This must be plain to any one who takes an evening walk in the variously-lighted parts of the Leipziger Strasse. Absolutely considered, if we can set aside our custom of thinking a deep yellow light pleasant and a less yellow light blueish, it cannot be doubted that the white light is the more beautiful. This is the opinion of many eminent artists who have acquired by their calling a more rapid insight into the relations of colours. Certainly it must be said that the juxtaposition of deep yellow and pale yellow lights is confusing where the difference cannot be utilised for decorative or artistic purposes.

It is to be regretted that the struggle between a yellow and a whiter colour which has hitherto been waged as between gas and the electric light, has now been transferred into the electric camp by the incandescence lamp, which is about as yellow as gas light.

This yellow tint of the incandescence light, as it agrees with what we have been accustomed to, may perhaps accelerate its adoption. But it is, in my opinion, a mistake to consider it an absolute advantage. It is to be lamented, because if the incandescence light is preferred from its ready divisibility, we lose the opportunity of getting rid of the bad habit of mistaking yellow in the evening. But in my opinion the reason for the slow adoption of the arc light is not so much the unusual colour, as the fact that it gives too large and powerful sources of light. Hence the establishment of central machine stations for the arc light alone is rendered more difficult. Until these stations are obtained it is too costly and inconvenient for private houses. But if, by dint of the adoption of the incandescence light, such stations are called into being, many will reflect that with an arc light they can obtain 880 normal candles per horse-power, as against 130 to 150 per horse-power, and will hence, in large rooms, give the preference to the arc light, and become accustomed to the difference of colour. At any rate the incandescence light should not be brought into conflict with the arc light. The future of electric lighting lies in the union of both. The one has the greater power of division, and the other the power of producing an intense light at a relatively low cost. Both have the common advantage of securing the purity of the air and safety as concerns fire. But many years may pass before this future is reached.

The Railway and Electric Appliances Company (Limited).—The directors of this company have concluded a contract with the firm of Messrs. Latimer Clark, Muirhead and Company, for the purchase of their extensive works and business from 1st January, 1883. They have also secured the services of Mr. Latimer Clark as a director and those of Mr. Muirhead as general manager of this branch of the company's business.

LEA'S ARC ELECTRIC LAMP.

THIS apparatus appears to be somewhat complicated in comparison with many better known and more frequently used lamps; but it contains several points of interest which make it evident that the inventor knows what difficulties exist in arc lamps, and which show more than an ordinary degree of skill in the attempt at overcoming such drawbacks.

It will be seen that springs are somewhat numerous in Lea's lamp, and these may be thought delicate and easily damaged, but as a matter of fact we do not observe, after a careful examination of the invention, any extra liability to derangement. A general view of the lamp is shown in fig. 1, and details of working parts in figs. 2 and 3.

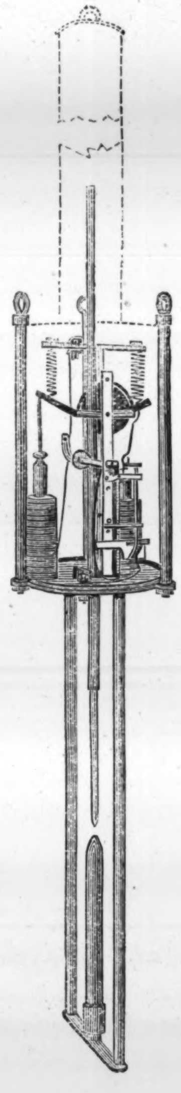


FIG. 1.

The upper carbon is held in position by rollers, *a*, a^1, *a* (by preference three), two of which, *a* and a^1, are mounted in a metal frame, A, which frame also carries a frame, *b*, in which is mounted the third roller, a^2. This third roller is a riding or jockey roller, adjustable to any given pressure by means of the spring, *c*, adjusting screw, c^1, and thumb nut, c^2, the spring being attached to the frame of the jockey roller at c^3. This jockey roller, as shown in the drawings, is in the position it would occupy if a carbon of large diameter (as represented by the dotted lines), say, three quarters of an inch, be placed in the lamp between the riding or jockey roller, a^2, on the one side, and the two rollers, *a*, a^1, on the other side. Should a carbon of smaller diameter be placed in the lamp, the jockey roller would close upon it by the action of the spring, *c*, and by means of the nut c^2 sufficient tension can be put upon it to prevent its weight revolving the three rollers, and allowing the carbon to fall through by gravitation. The roller, *a*, is of larger diameter than the other two rollers, and all the rollers are grooved, to allow of different sized carbons being placed between them.

The lower or negative carbon is held in its place by a clamp, and is maintained therein by a screw, so placed that the said screw will hold any sized carbons in a line with each other.

The feeding action, for lowering the upper carbon as it is consumed, is as follows :—

A solenoid, M, or an electro-magnet, is employed, and actuates a gripping lever, *d*, for the purpose of revolving the rollers, and this solenoid or electro-magnet, is connected as a shunt from the main circuit ; this shunt circuit is divided to allow of a variable resistance by being wound differentially, or in two parts. When the first part of the wire is wound on, a wire, *m*, is attached, and is brought out of the coil and then attached to a metal block, *e*, to which is fastened a spring, *f*, the second part of the wire, m^1, is then wound on, but in the opposite direction, and its end brought out, and attached to the metal base plate of the lamp at *i*, or this second wire may be placed in the lamp as a resistance coil, and a branch wire from the connection run up to the spring and attached to it at one end, and the other end of this resistance coil attached to the base plate.

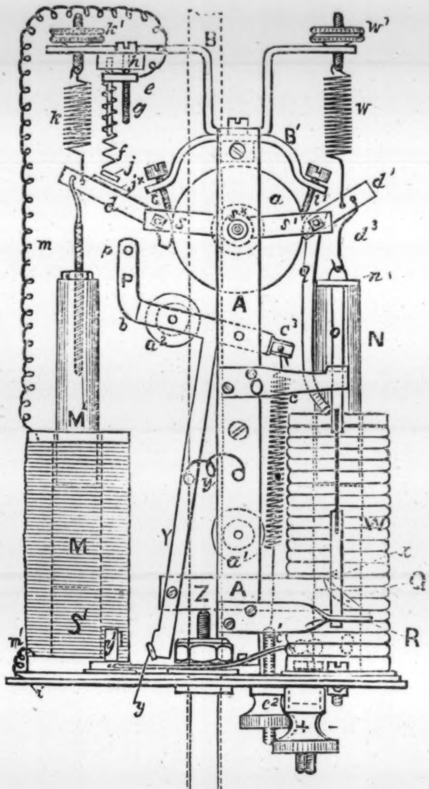


FIG. 2.

M^1 is the core of the feeding solenoid.

The metal block, *e*, to which is fastened the spring, *f*, is placed upon an adjusting screw, *g*, passing through a block of insulating material, *h*, so that by turning the screw, *g*, the spring, *f*, can be lowered as required. Upon the end of this spring is a platinum piece, *j*, and another platinum piece, $j^{\times}$, on the gripping lever, *d*, to form contact to cut out the resistance coil or second wire, upon the solenoid or electro-magnet.

The gripping lever, *d*, is suspended at its outer extremity by a spiral spring, *k*, and an adjusting-screw, k^1, which latter passes through the angle-piece, B, secured to the top of the frame, A. The other end of this gripping lever is jointed upon two arms, *s*, s^1, which are connected to the frame, A, on each side of the roller, *a*, and fit loosely on bush-pieces, $s^{\times}$, let into the frame through which passes the arbour upon which the roller revolves.

A second solenoid, W (or an electro-magnet), is employed to form the arc by separating the upper and lower carbons. It is shown arranged with its spiral spring, *w*, adjusting-screw, w^1, gripping lever, d^1, and arbour.

The core, N, of this solenoid has a projecting piece, *n*, attached to it and from this piece a rod, *o*, extends downwards until it passes through an arm, O. This rod is thinned down for a short distance to form a spring (or a spring may be inserted therein, as shown), when it again takes the same shape as the portion above the spring, and abuts against a piece, R, attached to the frame, A. At this point the rod has a pin or stud, *r*, which strikes against and catches a cam, Q, when the lamp is extinguished, and by the spring, *w*, pulling up the core, N, displaces the jockey-roller, a^2, by the stud, *r*, catching the cam and pulling forward the extension-piece, Z, on the long arm, Y, thus allowing the carbons to come together ready for relighting, and not depending solely on the stud, *p*, on the jockey roller frame, P.

B^1 is a bent arm carrying set screws, *t*, t^1, against which the arms, *s*, s^2, rest, allowing the spiral springs, *k* and *w*, to just pull the gripping levers, *d*, d^1, off the periphery of the roller, *a*.

At the bottom of each solenoid is a piece of iron, S, S^1, held fast therein by being screwed into the base-plate. These pieces, S, S^1, serve to draw down the cores, M^1 and N, of the solenoids, M and W, attached to the gripping levers, *d* and d^1, and on the arc making side to hold down the core firmly.

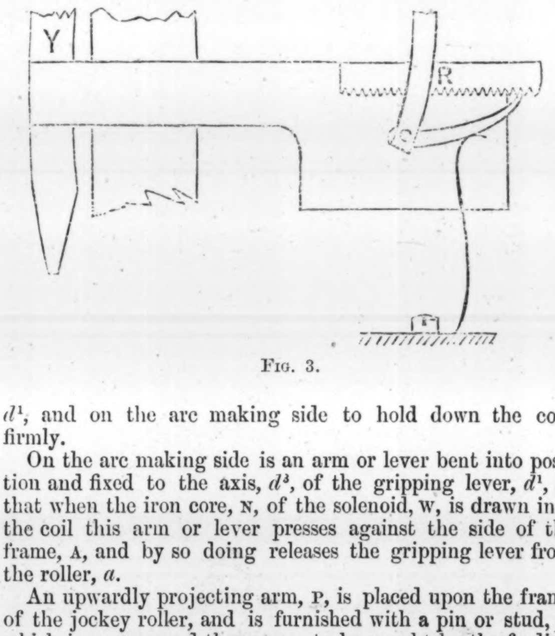


FIG. 3.

On the arc making side is an arm or lever bent into position and fixed to the axis, d^3, of the gripping lever, d^1, so that when the iron core, N, of the solenoid, W, is drawn into the coil this arm or lever presses against the side of the frame, A, and by so doing releases the gripping lever from the roller, *a*.

An upwardly projecting arm, P, is placed upon the frame of the jockey roller, and is furnished with a pin or stud, *p*, which is so arranged thereon as to be caught by the feeding lever, *d*, should the carbons be apart, and to act upon and release the jockey roller and allow the carbons to come into contact.

A short-circuiting arrangement is also placed upon the frame of the jockey roller, so that when the upper carbon is consumed, or if by accident the carbon should break, contact is made at *y*, upon the insulated stud, y^1, which is in connection with the negative terminal, and as the positive terminal is in connection with the frame, A, short-circuit is made and the lamp cut out. If the upper carbon should be consumed, until the top of such carbon descends below the roller, *a*, then by the pressure caused by the spring, *c*, the upper carbon would be displaced, the jockey roller would be drawn inwards, and the long arm, Y, would come in contact at y^1. The wire connecting the short-circuiting stud, y^1, to the negative terminal, may be of the same resistance as the arc, if required, so that the resistance of the line will remain the same.

The action of the lamp is as follows :—

When to be lighted, and should the carbons be apart, the current enters at the positive terminal, and, traversing the shunt-coil, M, pulls down the core, M^1, until the gripping lever, *d*, comes against the stud, *p*, on the arm, P, and displacing the jockey roller causes the upper carbon to come into contact with the lower carbon. The current then passing by the thick wire solenoid, W, the core of the shunt-coil is drawn back by the spring, *k*, the core, N, is brought down upon the piece of iron, S, the arm, *x*, displaces the gripping lever, *d*^{1}, after turning the roller, *a*, in the proper direction, and the arc is formed.

The core, N, remains down all the time the lamp is alight. As the arc becomes longer by the carbons being consumed, so more current passes by the shunt, gradually pulling down the core, M^1, until it causes the contact to be broken between *f* and *d*, when the greater resistance being thrown in allows the spiral spring, *k*, to pull back the gripping lever, *d*, ready for the next feed, and so on.

This description, which has been taken from the specification of Mr. Lea, requires a slight modification in one or two points. For instance, the arrangement for short-circuiting at present adopted is that shown in fig. 3. The cam is replaced by a horizontal toothed rack, R, which will allow of greater range in movement, and ensures greater certainty of action than did the cam. The shape of the long arm, Y, is also altered, as may be seen in the general view of the lamp. Mechanically speaking, the feeding movement, and the method of "striking the arc," adopted by Mr. Lea, is uncommonly like that shown in letters patent obtained, we believe, by Common and Joel some time in 1880. The method of producing *regularity* of feeding, however, seems to be a most essential point in Lea's invention, and is certainly clever. The short-circuiting apparatus is also good, and altogether Mr. Lea has not allowed much to escape his notice in the requirements for "arc" lighting. We believe his lamps, as at present constructed, will take a sufficient length of carbon to last for twenty hours' burning without replenishing. Several of them may be seen in the Werdermann exhibit at the Crystal Palace, where they are in action each night with complete success. We are glad to recommend this lamp strongly to the notice of our readers, for though at first sight it may appear complicated, it is in reality a very substantial apparatus, and exceedingly well designed electrically.

We believe Mr. Lea has several improvements in view to render his invention less open to any objections that may be raised against the numerous springs employed, and in other minor matters; but as it stands it shows more than ordinary skill in the knowledge of both mechanical and electrical details.

ON THE MODE OF WORKING OF DYNAMO-ELECTRIC MACHINES.

AFTER all that has been written about dynamo-electric machines, it would seem that their working, either as generators or as receivers, must now be understood by every one. This, however, appears not to be the case, and we are led to revert to the cause which, in an electric motor, produces a counter-electromotive force.

In a theoretical dynamo-electric machine, *i.e.*, in a machine in which the inductive poles, A B (fig. 1), would be sufficiently powerful to maintain the poles of the ring in the direction A B, the neutral magnetic line of the ring would remain in the vertical line, N N', and on this line should be placed the points of contact between the rubbers, F F, and the collector. In order to produce a current with such a theoretical machine, it would be immaterial in which direction the armature were made to turn; the effect produced would always remain the same.

But this is not the case in practice. The inductive poles are not sufficiently powerful to keep the poles of the ring in the line A B, and it is observed that in order to obtain the maximum of current, it is necessary to place the brushes so that the line joining their points of contact with the collector may be made to advance in the direction of the rotation of the ring. In proportion as the brushes are removed from this position, the intensity of the current collected diminishes, and when the rubbers are 90° from their original position no current is obtained. This position in which it is necessary to place the brushes represents that really occupied by the neutral magnetic line of the ring in the machine, and we may say that in dynamo-electric machines the neutral magnetic line of the ring is drawn out of its theoretical position in the direction of the rotation of the armature.

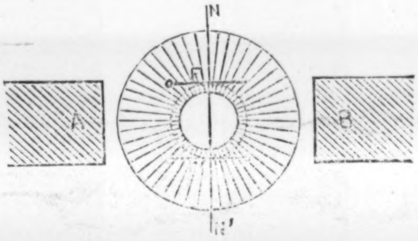


FIG. 1

M. Frœlich considers this phenomenon as a kind of attraction of the magnetism of the ring by the rotation. M. Marcel Deprez explains it* by saying that the ring is subjected to two magnetic actions, one due to the influence of the poles A and B, the other to the action of the current circulation round the ring. These two actions produce a magnetic resultant for which the neutral magnetic line takes the position indicated to be given to the brushes.

In practice the direction of the rotation is no longer immaterial.

If, for example, the armature of a machine, A B (fig. 2), is made to turn in a direction contrary to that of the hands of a watch, the neutral magnetic line of the ring will take an inclined position, *n n'*, and the position of the brushes will be represented by F F'. If, on the contrary, the rotation is in the direction of the hands of a watch a contrary effect will be produced and the neutral line will take up a new position, *n'' n'''*, symmetrical with the first one in regard to N N', and the position of the brushes will then be represented by *f f'*. We should have, therefore, according to the direction of rotation, two positions of the brushes in symmetry with each other. Let us now proceed to the case in which the dynamo-electric machine is used as a motor, and in order to do this we will consider a machine, A B (fig. 3),

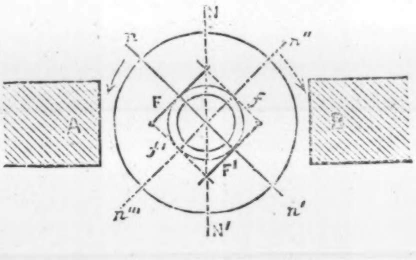


FIG. 2.

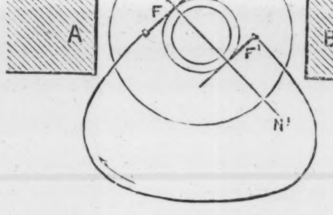


FIG. 3.

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* See *Comptes Rendus* for June 12th, 1882, and *La Lumière Electrique* for June 17th, 1882.

which is at first made to turn mechanically in the opposite direction to the hands of a watch. The neutral magnetic line of the ring will be, say, N N′, the position of the rubbers F F′, and the apparatus will send into the outer circuit a current, the direction of which is represented on the diagram by an arrow. We will now suppose that we cease to turn the machine mechanically, and that we introduce into the outer circuit a source of electricity producing a current similar to that generated by the machine at first. The machine, A B, will work as a motor, and its armature will begin to turn in the direction indicated by the upper arrow, *i.e.*, in a contrary direction to its former rotation. But as the current passing through the ring is the same as that which passed through just before when the machine was a generator instead of a receiver, the distribution of magnetism in the ring is not changed, the neutral line remains at N N′, and the brushes keeping at F F′ are in the position required in order that the inductions produced in the ring may communicate to them a difference of potential and tend to produce a current. If, now the external source be suppressed, and, in the hope of obtaining a current, the armature be made mechanically to turn in the direction in which the current caused it to turn, *i.e.*, in the direction of the movement of the hands of a watch, we find ourselves precisely in the conditions represented in fig. 2, in which the brushes being at $n'' n'''$, the brushes must be at $f f'$. The position F F′ of fig. 3 is therefore exactly the reverse of what it should be in order to obtain an appreciable current, and the nearer the angle made by the two opposite positions of the line is to 90° the weaker will be the current obtained. On the contrary, by making the machine turn in the opposite direction to that of its rotation as a motor the maximum of current will be obtained.

From this it follows that for a machine turning in the same direction as generator and as motor, the two positions that the brushes should occupy are reversed and coincide in each case with the position of the neutral magnetic line of the ring.

We see also that if we were considering a machine with permanent magnetic field like a magneto-electric machine or a dynamo machine with separate excitation we might keep to one position of the rubbers, whether it were used as a generator or as a receiver, but on condition that it should turn in opposite directions in the two cases, and that consequently the rubbers should be enabled to work for either direction of rotation. Now, in the majority of machines the brushes are constructed for one direction of rotation of the armature only, and hence follows the necessity of preserving the same direction of rotation in both modes of employing the machine.

On the other hand, with dynamo-electric machines properly so-called, if as motors they are made to turn in the same direction as when they are used as generators, the polarity of their inductors would be reversed, and after the experiment the residual magnetism of the inductors would be reversed. The machine employed afterwards as a dynamo-electric machine would no longer be put in motion in the same direction as before. This is another still more weighty reason for preserving in both cases the same direction of rotation, changing necessarily the position of the brushes. The above considerations will, we think, suffice to show that we need not seek any other cause for the counter-electromotive force than the rotation of the ring itself.—*Aug. Guerout in "La Lumière Electrique."*

REVIEW.

A Dictionary of Electricity; or, The Electrician's Handbook of Reference, &c. By HENRY GREER. New York: College of Electrical Engineering, 122E, 26th Street.

WE have received specimen sheets of the above work, together with a printed slip giving the opinions of American electrical celebrities. Titles are cheap across the other side of the Atlantic, accordingly we have it stated that "Professors" ! ! ! ! Edison, Brush, Weston, and Pope "thoroughly approve of this work." Although no doubt the opinions of the eminent "Professors" before mentioned have due weight in their own country yet over here we venture to say that "we do not thoroughly approve of this work," in fact we have a great deal to find fault with; we cannot, indeed, congratulate Mr. Greer upon the success of his attempt to produce "A Dictionary of Electricity." It is of course difficult to judge from a few pages whether the bulk of the work contains much matter of a sound and good description, but if there is nothing better than what we have before us we must confess that the work cannot be recommended. The author in the very first line makes an erroneous and misleading statement. Under "A" we have "ACCUMULATOR—An instrument that accumulates electricity." Under the third heading we have "ACCUMULATOR, THE NEW—An accumulator smaller than Faure's, each cell containing 400 ampères of current." The Edward's bell (we are told) "notifies *silently* if any doors or windows are left open." "Multiple arc," we are informed, means "several *lamps* in *series*." The following description is decidedly lucid: "ARMATURE, SIEMENS'.—This armature acts admirably as an electro-dynamic armature. Three (!) layers of silk-covered wire are secured upon it longitudinally in the grooved sides and over the ends of the armature." What could we wish for better than this? The Audiometer, we are informed briefly, is "A Sonometer." Speaking of the Daniell Battery the author says: "To charge this battery you put water in the porous cup and the glass vessel. In about an hour enough sulphate of copper will have been dissolved to put the battery in action." Nothing is said about any crystals of sulphate of copper being required. Again, "An earth battery is made by placing a long sheet of copper on moist earth, and at the other end (other end of what?) a long sheet of zinc, &c." We might easily multiply instances of the author's brilliant explanations in the few pages we have received, but we forbear to do so. The work, if it is to be of any real value, requires a thorough revision at the hands of some one more competent than Mr. Greer; in a few instances, it is true, the author has to some extent succeeded in giving useful information in a brief form.

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer, not necessarily for publication, but as a guarantee of good faith.

Letters, &c., for the "Correspondence" columns should arrive not later than Tuesday morning if they are desired to appear in the following number, such communications to be addressed to the "Editors," ELECTRICAL REVIEW, 22, Paternoster Row, London, E.C.

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CORRESPONDENCE.

An Improved Thomson Reflecting Galvanometer.

I am much obliged to you for drawing attention to my remarks relating to the effect of the turns in a tangent galvanometer coil, which are certainly not so clearly put as I could wish, but if the reader will insert *of one turn* after "tangent galvanometer" he will see my meaning. I certainly did not mean the "very different thing" which you say is well known.

If electricians "who know anything of their work" are able to attain "perfect accuracy" with the ordinary instrument, I can see nothing in my instrument which would prevent them from obtaining a similar result, as the total resistance to motion is very little if at all larger than that ordinarily found, and I am of opinion that for everything but ballistic experiments it could be advantageously increased.

Francis J. Mudford.

Who is the True Inventor of the Bell Telephone?

Having read with no little interest "A Contribution" signed "Das Telephon," published in your Review of 6th inst., I take leave to supplement the facts cited by "Das Telephon" in support of the claim of Reis to be the inventor of the speaking telephone, with some *opinions* of eminent living experts, and with a recital of facts established by trials of Reis's receiver in open court before Mr. Justice Fry.

Sir William Thomson said: "If a Reis receiver were used with a good transmitter one could hear articulate speech."

Professor Silvanus P. Thompson said: "He had used the Reis successfully with its own receiver and transmitter. Sometimes I get speech, sometimes imperfect speech, sometimes mere noises, and the best telephone in the world would give these noises sometimes."

Mr. Justice Fry said: "It is perfectly true that there is some evidence before me that Reis's instrument will speak." Now, the evidence which Mr. Justice Fry had was a trial of the Reis instrument in court by Mr. Justice Fry himself, and he said he heard it speak.

Can any better evidence be required to establish the fact that Phillip Reis was the inventor of the first speaking telephone?

I now ask, Who is the real inventor of the Bell telephone receiver? and my reply is, Sir William Thomson; which fact is proved by the testimony of Sir William himself. The Bell receiver, from which Sir William Thomson heard *faintly* a few words at the Centennial Exhibition in Philadelphia, is described by Sir William in these words: "An electro-magnet with an iron cylinder around it, and with a flexible iron disc." The instrument given to Sir William by Professor Bell—now well known as the "Glasgow receiver," had the disc cocked up, screwed at the edge of the cylinder, but touching it at no other point. Sir William being asked whether Bell told him it was an essential part of his invention that the disc must be *always cocked up*, replied in the emphatic monosyllable "Yes."

Now we have the evidence of Sir William, "that neither he nor his assistants could make anything of this instrument; they were obviously not practically useful instruments, and it was obvious a new invention was necessary before they could be so."

Here then is the sworn statement of Sir William that the instrument with the *cocked up disc* was not a practical, useful instrument.

What is the instrument, then, which Sir William says he used in Philadelphia, of which Sir William testified as follows: "I thought there was an enormous way to be gone before it was made into a practicable, useful instrument, and I had reason to think so because of the exceeding difficulty we had in hearing the words. It was with the most exceeding silence in the neighbourhood that we could hear the words at all; and I do not think any one except Mr. Watson and myself heard: other people tried and they could not hear, but we were exceedingly anxious to hear, and took every precaution for silence, and *held the instrument exactly in the way which seemed to bring out its sensibility*, and I heard distinctly myself." I ask what is the exact way in which Sir William held the instrument when he heard? He tells us himself "*when the disc was pressed down by the ear.*" This instrument with the disc pressed down by the ear is certainly not the same instrument which Sir William testified Professor Bell told him "*the disc must be always cocked up.*"

Bell's instrument with the disc cocked up cannot reproduce articulate speech, but Sir William Thomson's improvement of it by pressing the disc down did and does reproduce articulate speech. Is not Sir William, then, the inventor of the present Bell telephone? He surely could have secured a patent in the United States, where the *first inventor only* can secure a patent, and he would have prevented Bell from securing a patent for the iron disc held down all around its edge. This is a very slight alteration of Bell's Glasgow receiver, of which Mr. Justice Fry said: "this difference may appear to be small, but small diversities in delicate matters often make the whole difference between success and failure." Sir William did not apply for a patent for his great discovery, but Professor Bell did, and a patent was issued to his representative, Morgan L. Brown, on December 9th, 1876, for "Improvements in Electric Telephones," which improvement Sir William Thomson testified was the substitution for the disc held at one point, "of a disc held all round its edge." Sir William Thomson was no doubt the *discoverer* that an instrument with an iron disc held all round its edge could reproduce articulate speech, but Professor Bell was the *patentee* of this identical device.

All the quotations above are taken from the Report of the Telephone Case before Mr. Justice Fry in May last.

W. C. Barney.

January 9th, 1883.

[Our correspondent has certainly evolved a startling theory from his intimate knowledge of matters telephonic, and we can imagine Sir William Thomson's feelings at not having had the foresight to secure a patent for an apparatus which he was *in confidence* experimenting with.

It is now, however, too late to mend matters, and as Sir William does not, we believe, claim that which our correspondent credits him with, we publish the above letter more with the view of showing the writer's (we think mistaken) ingenuity rather than for any real value it possesses.—EDS. ELEC. REV.]

The State Purchase of the Telegraphs.

I should be glad if any of your numerous readers could give me information regarding the purchase of the telegraphs by the State, principally on the following points:

1st. Was the Postmaster empowered by Act of Parliament to purchase, or was an agreement come to with the companies beforehand?

2nd. How were they paid, and what was the total sum?

3rd. Are there any works to be had on the subject?

Apologising for occupying the space of your valuable journal, I remain, yours faithfully,

J. Fraser.

London, *8th January*.

Electro-Motors.

Referring to the letter of Mr. Moritz Immisch, in your issue of to-day, I observe that he challenges Professor Thompson to prove that "when a motor of an electrical efficiency of 90 per cent. runs free that the amount of zinc consumed in the battery is only one-tenth to what it is when the motor is at rest." I think, sir, that the following experience seems to point to a similar conclusion. During the past harvesting season I employed two of my dynamos, having very nearly the same weight of wire upon each, to transmit the power of a small stationary engine to an exhaust fan in a rick-yard at a short distance from my workshop. I then observed that when I ran the motor free my small engine also ran free, with the governor cutting off steam almost entirely; but the moment the fan was thrown into gear the engine was checked, and required full steam to drive the generator. Moreover, when using the same "system" to transmit power to a 10″ circular saw, I found on more than one occasion that the belt between the engine and *generating* dynamo was thrown off by the sudden work thrown upon it by bringing a piece of wood against the saw to begin a cut. This would seem to point to the conclusion that more (I cannot say ten times more) steam is consumed in driving the *generator* when the speed of the motor is *reduced;* and by gradually bringing the motor to a standstill by forcing too heavy a piece of wood against the saw I found that I could so far increase the load thrown on the engine, which is very small, as to bring it also to a standstill on a dead centre. As far as I know, the consumption of steam in driving the generating machine is much the same thing as the consumption of zinc in the generating battery.

If I am in error I hope that some one will kindly point out my mistake. I have sent this account of my experience because I believe that it may prove interesting to some of your readers, and I leave Mr. Immisch to give his own explanation of the facts which I have observed.

F. M. Newton.

82, Pakenham-road, Dublin-road, Belfast,
January 6th, 1883.

Dynamo-Electric Machines.

In a Schuckert dynamo-armature are the hanks of wire wound continuous—that is—is each one joined or connected to its adjoining one all round, or is each one separate and its own ends carried to its respective plate in the commutator? Your answer in your next issue will be highly esteemed.

Yours truly,
Inquirer.

14, Glen Villas, Holly Park, New Southgate, London,
January 9th, 1883.

[In the machine mentioned by our correspondent the coils of the armature are joined up to the commutator in precisely the same manner as those on a "Gramme."—EDS. ELEC. REV.]

Electric Lighting.

In the *Globe* of the 5th inst. there appeared: "Willis's Rooms were successfully lighted for the first time on Tuesday night with the Brush electric light; the existing chandeliers and brackets were utilised without any disfigurement of wall or ceiling."

As this is, by the "Brush" proper system, an impossibility, it evidently must allude to the "Lane-Fox" incandescent. Now, I really do think that the "Metropolitan Brush" should be candid in their statements, not endeavouring to mislead the public, for there can be no doubt that you might as well try to run a "Cable" through the eye of a needle as to place a Brush light in chandeliers or brackets.

Electron.

Jan. 6th, 1883.

[We do not think that the Metropolitan Brush Company is to blame for the paragraph which our correspondent quotes. It is apparently inserted with the usual disregard of accuracy so generally evinced by writers in the *daily press*. "Electron" will doubtless have since noticed (in our columns) that lighting by incandescence was referred to at Willis's Rooms.—EDS. ELEC. REV.]

Your editorial note on the Aberdeen town lighting by the Brush Company of Scotland, after remarking that the large hall of the municipal buildings is lit as perfectly and agreeably as could be wished, and that it is a great success, goes on to criticise the installation of our lights in the streets, at most of which I take exception.

In the first place the piercing character of the light was not so great but that hundreds of people of all ages and both sexes crowded into the place where the lamps were being tried and there gazed on the concentrated light of sixteen arc lamps without giving any expression that the light was unpleasantly strong to them. Now, when we come to take one of these lamps and raise it 20 ft. above the street, I think that its rays being considered too piercing arises from imagination.

Considering also the expediency of obscuring the light by opalescent or ground-glass globes. By hiding it in this way from 30 to 60 per cent. of the light is lost, which means an increased cost to the inhabitants. Obscured globes also tend to hide defects in the arc and to allow negligence to creep in, while nothing is more searching and requires that the best type and construction of lamp should be used than clear glass globes. The state of many of the ground-glass globes in the streets of London, as seen in the daytime, dirty and smoke-obscured to such a degree that the bright beams of the electric light appear reddened, is sufficient to make one eschew this form of obscuration.

E. W. Beckingsale,
General Manager and Electrician Brush Electric Light and Power Company of Scotland.

119, St. Vincent Street, Glasgow.

Electrical Instruction.

I HAVE to thank you for your great kindness in awakening me from the delusion that my answers to the "City and Guilds" examination questions, which are now appearing in the pages of a contemporary, were fairly accurate according to generally received notions. I should, moreover, feel exceedingly obliged if you or one of your numerous and talented staff would kindly point out the inaccuracies referred to, both for my own benefit and for that of those who may have read my answers.

I may, however, remark that in the answer to Question 3, by an inadvertent slip in writing, the word field-magnets occurs instead of armature. This, of course, could not be one of the inaccuracies referred to, as what was intended would be patent to any one having the smallest amount of knowledge concerning dynamos.

E. C. Rimington.

School of Electrical Engineering,
12, Prince's Street, Hanover Square,
January 9th, 1883.

[With the insertion of Mr. Rimington's letter, and our subjoined answer thereto, we hope that the controversy on this subject, commenced by Mr. Fitzgerald, will come to an end. We notice that our contemporary proposed answering many of the questions set for the examinations at the City and Guilds Institute, "more to give information than to give a specimen answer." We are not aware whether Mr. Rimington is a "demonstrator" in the school which has previously been referred to, or merely a student. In the latter part of his answer to Question 10 our correspondent says:—"Thus the current through each of the 17 lamps is only *one-half* of what it was through *the one lamp*, and as *light* varies as the *square of the current*, if the one lamp gives 16 candle-power, each of the 17 will give only 4 candle-power." Is this correct, or in other words, does the luminosity increase in *direct* proportion to the heating effect? We think not.

In answer to Question 1, December 30th, is the statement correct that in *average* engines one H. P. can be obtained by the consumption of 2½ lbs. of coal per hour, and that an *ordinary* gas-burner with the best gas gives a light of 30 *candles* per 5 *cubic feet* consumed per hour? Again, "11·3 cubic feet of gas are obtained from the destructive distillation of 2½ lbs. of coal. Therefore 1,500 *candle-power* requires 4·42 lbs. of coal in the shape of *gas*." We are inclined to think that something more than an average engine is required to do that which Mr. Rimington claims for it, and his gas calculation is altogether outside our experience. In answer to part of Question 8, January 6th, is it correct to state that "the armature having *10 times* the resistance would have *10 times* the number of convolutions if wound with the same sized wire?

Is no allowance to be made for the increasing length of each convolution as the coil becomes larger?

Our correspondent has himself drawn attention to an error in another of his answers, but not in a manner which gives one the idea that he is supposed to be dealing with students who, as a rule, *have* only the *smallest* knowledge of dynamo-electric machines.

Having given here a sufficient proof of the accuracy of our previous words we do not deem it necessary to carry the main subject of the controversy any further. We should not have had occasion to refer to Mr. Rimington's papers but for the manner in which Mr. Fitzgerald had alluded to them, or others, in our last issue.—EDS. ELEC. REV.]

Telephone Extension.—Efforts are at present being made by the National Telephone Company to extend their system from Heckmondwike to the various places in the Spen Valley, and a survey with this object has been made, though no communication of an official character has been made on the subject with the Cleckheaton Chamber of Commerce. It is stated that the project is to connect these places direct with Leeds, Bradford, and various centres of commerce in Yorkshire. Although the system is in operation at Heckmondwike, the advantages thus afforded are not generally utilised.—*Leeds Mercury*.

NOTES.

Errata.—In Mr. Sabine's article on Electric Light Leads, in the last number, the following corrections are required :—Page 10, col. 1, line 30 from top, for "40 Brush lamps" read "20 Brush lamps." Col. 2, line 36 from top, after "sufficiently insulated," add the words, "with the same material."

New Names for Old Friends.—A correspondent, writing to us on the subject of Dr. Siemens' proposal to call the incandescence lamp a "glow" lamp, says :—

"Whatever objection is valid against 'incandescence' on the ground that the carbons of arc lamps are also incandescent is equally valid against the word 'glow.' Besides this, the name 'glow-lamp' is essentially un-English, being contrary to the spirit of the language. A glowing-lamp would be more English. We speak of a bed-room as a sleeping-room, not as a sleep-room ; an eating house, not an eat-house ; a dining-room, not a dine-room. Such words would be barbarisms totally contrary to the spirit of the language Macaulay used. Carlyle, who was a greater innovator than grammarian, tried, with questionable success, to graft in English a mongrel Scotch-Germanism, which stamped the writer as original, but did not improve the language.

"To return to 'glowing.' The word has not the same weight as 'incandescent.' It is a mild form of describing luminous heat, and is fairly translated into German by the word *glühend*. But that condition which we commonly call incandescent, a German would call *weisz glühend*. The faces of our children 'glow' with health and vigour ; but with all respect to the dictionaries, we should be seriously alarmed if they were said to be incandescent under any circumstances."

Perhaps, however, some of the companies possessing incandescence electric lamps which only "glow" may accept the latest term as being the more correct.

The Late Dr. Fife Jamieson.—The memorial, which was subscribed for by the fellow-students and friends of the late Dr. Fife Jamieson, including the staff of the Direct United States Cable Company at Torbay, Nova Scotia, whose death in April last occasioned so widespread a feeling of sadness, has now been completed. It is in the form of a tablet placed on the wall of the Cathedral, Old Aberdeen. The work is designed and executed by Messrs. Macdonald, Field and Co., Aberdeen, and is remarkably chaste and beautiful. The tablet is of white marble on a background of black marble, measuring about five feet in height by about three feet six inches in breadth. The design and the execution are alike creditable to Messrs. Macdonald, Field and Co., and will well repay an inspection. It is placed on the north side of the east end of the church, and forms a striking and beautiful object when seen from a distance as well as near. The inscription is :—"In affectionate remembrance of Fife Jamieson, M.A., M.B., C.M., Demonstrator of Anatomy in the University of Aberdeen, son of the Rev. Geo. Jamieson, B.D., of Oldmachar. Born 19th March, 1854. Died 18th April, 1882. Erected by his fellow-students and friends, who at the same time founded a medal in the University in his name." The principal part of the sum subscribed has been funded, and will be sufficient to provide a gold medal, which will be awarded annually in the Anatomy Class, under regulations which have been agreed on by the committee. The first award will, we understand, be made at the end of the present session.—*Aberdeen Journal, January 2nd, 1883.*

Society of Telegraph Engineers and Electricians.—At the meeting of the society to be held on Thursday, the 18th inst., at eight p.m., Mr. Willoughby Smith will deliver his inaugural address as president for the ensuing year.

Electric Lighting in Dublin.—At a meeting of the Lighting Committee of the Dublin Corporation held last week, the question of electric lighting was dicussed, and it was unanimously resolved to engage the services of Mr. Angelo Fahie, C.E., of Dublin, as Consulting Electrician to advise the committee on the subject.

Electric Lighting.—The Town Council of Halifax decided at last meeting that no further steps should be taken with respect to the application to the Board of Trade for a provisional order for supplying electricity within their jurisdiction.

The installation of the electric light at Messrs. Bell Brothers', Page Bank Colliery, which we noticed in a recent issue, continues to give satisfaction. The Haswell and Ryhope Collieries are shortly to be lighted on the same system, and other collieries are expected to be similarly illuminated at no distant date.

The Yorkshire Electric Light and Power Company has begun operations at Middlesborough by supplying the North-Eastern Steel Company, Messrs. Gjers, Mills and Co., Jones Bros., and several other firms with the electric light.

On Thursday week the Sheffield Town Council received from Mr. Conrad Cooke his report on the electric light for Sheffield. Mr. Cooke recommended that the streets of the town should not be lighted by electricity but by gas. From the notes we have from time to time published our readers will have gathered that a considerable amount of feeling existed in Sheffield on the subject of electric lighting, one section being strongly opposed to it, the other as strongly in favour of it. As was, therefore, to be expected, the recommendation of Mr. Cooke created much surprise, a surprise by no means confined to Sheffield. The *Pall Mall Gazette*, commenting on the foregoing, says:—The confusion in which the municipal mind is involved on the subject of the Electric Lighting Act could not be more remarkably illustrated than by the way in which the Sheffield Town Council has dealt with the subject. After a long discussion, it first of all decided to apply for a provisional order, and notice was given accordingly. When the minutes of the meeting at which that decision was arrived at came to be confirmed, the Council was almost evenly divided, and after several divisions a majority of one or two decided against confirming the minutes. The Electrical Committee had, however, appointed their electrical engineer, and it was said they were determined to go on. Yesterday, however, when the committee met, it was startled by receiving a report from its electrical engineer condemning the use of electricity for street lighting, and recommending the continued use of gas. After this we need not expect to hear much more of the application from Sheffield for a provisional order under the Electric Lighting Act. If electricity is introduced in Sheffield, the risk will be taken, as it ought to be, by a private company, and not by the representatives of the ratepayers.

According to the *Mining Journal* the electric light is making fair progress in the South Wales district. Opinion, however, varies as to its suitability for all purposes. In the open air, at the theatres and circus, and various other public places, it answers its purpose well, but inside the morning newspaper offices at Cardiff it is not so successful.

The Parliamentary Committee of the Cardiff Town Council sat for several hours on Tuesday se'nnight, considering the report presented to the Council by the Town Clerk (Mr. Wheatley) and the Borough Engineer (Mr. Williams), respecting the powers of the Corporation as to the regulation of the arrangements for electric lighting, and as to the application for a provisional order by the Great Western Electric Light and Power Company. It is understood that the Corporation do not desire to place any obstacle in the way of electric lighting, but are anxious that the safety and welfare of the public should be secured.

Yesterday evening, says the *Bombay Times* of Dec. 22nd, a large party of ladies and gentlemen assembled by invitation at Bella Vista, Cumballa Hill, the residence of Major Strutt, the managing director of the Eastern Electric Light and Power Company, to witness an exhibition of electric lighting on the incandescent principle. The interior of the bungalow, together with its spacious verandahs and the grounds adjoining, were lighted by means of some fifty or sixty lamps of the Lane-Fox pattern, each lamp averaging about twenty candle-power. The electric power was provided by means of a number of accumulators, which had been previously charged with electricity at the company's works at Mody Bay and conveyed to Cumballa Hill by coolies. One of the greatest novelties was the illumination of a fountain, the visitors being enabled by means of an arrangement of lamps placed under water to see with perfect distinctness the gold fish swimming about in the water.

An adjourned special meeting of the Camberwell Vestry to consider the question of electric lighting was held on Wednesday evening, the 3rd inst., under the presidency of Mr. E. Dresser Rogers. Many gentlemen were present, and an animated discussion was carried on, the business of the evening concluding by the proposal of the following motion: "That the draft provisional order of the Metropolitan Brush Company, asking for an undertaking to supply electricity to the parish of Camberwell, be referred to a committee consisting of Messrs. Dresser Rogers, Middlemass, Puckle, Simmonds, and Honywill, for their immediate attention; that they be empowered to make such objections and take such steps as will have the effect of obtaining clauses and conditions for the protection of the parish; that they have permission to employ the assistance of skilled electricians and counsel; and that they be empowered to affix the seal of the Vestry to a petition." Mr. Simmonds moved as an amendment: "That this Vestry oppose the granting of a provisional order to the Brush Company, and that a committee, consisting of two members for each ward, be appointed to superintend such steps, with power to employ skilled assistance." The amendment was carried, and the following gentlemen were appointed on the committee: Messrs. Honywill, Thwaites, Wrigglesworth, Lumley, Middlemass, Mulley, Faulkner, Wilson, E. C. Davis, Fermor, Simmonds, and Whiteley.

Mr. A. K. Mitting has been appointed consulting chemist to the Duplex Electric Lighting Company, and is understood to be engaged in experiments which are likely to prove of great scientific importance.

Mr. A. L. Lineff informs us that he has resigned the post of electrical engineer to the London and Provincial Electric Lighting and Power Generating Company.

The "Sun" Electric Lamp, as supplied by the Electric "Sun" Lamp and Power Company (Limited), of St. Margaret's Offices, Victoria Street, Westminster, has just been installed at Messrs. Singleton and Cole's premises, Wolverhampton, with great success. It is also being placed in Messrs. Finlay and Co.'s lace curtain manufactory at Doune, N.B.; the Bowling Iron Works, Bradford; and establishments at Glasgow, Salford, and elsewhere. The central station of the company, 6, Riding House Street, Great Portland Place, W., is now complete, and application has been made to the Vestry to light a portion of London from that centre. An exhibition of the light at the station will be made early next month, open to the shareholders, the press, and others.

The Brush system appears to be gaining ground rapidly in the North. We recently announced the lighting of the Dewsbury Theatre Royal by the Yorkshire Brush Electric Light and Power Company, Limited, with Brush arc lamps. This installation is giving much satisfaction, and the stage effects are very novel and brilliant. The company has now received an order for a similar installation at the Huddersfield Theatre Royal. An order has also been obtained for lighting up the Underground Market at Huddersfield; and the Town Hall is also to be illuminated on the 23rd inst., when Professor Allen will lecture on the Electric Light.

On Monday evening the annual *soirée* and *conversazione* of the Brighton School of Art took place at the Royal Pavilion, the whole suite of rooms being utilised. The electric light was used to illuminate the stage in the banqueting rooms, where dramatic representations were given, and also one of the Masonic rooms, where the students' work for the year was displayed.

The Scarborough memorial to the Board of Trade for a provisional order under the Electric Lighting Act has been signed and sealed.

At the meeting of the Broughty Ferry Commissioners on Monday a letter was read from the Brush Electric Light and Power Company (Scotland), urging the Commissioners to give a fair trial to their system of lighting, the directors being prepared to consider any scheme the Commissioners might suggest for the lighting of the chief thoroughfares, the Company charging so much per lamp per hour. The Company also pointed out that the expense of an application to the Board of Trade would be saved by an amicable arrangement, such as had been made in the cases of Aberdeen and Dundee. After deliberating for some time a committee was appointed to confer with the representatives of the Company.

The Montrose Town Council at their meeting this week took up the motion given notice of at last meeting, that the sanction of the Council be given to the application of the Brush Electric Light and Power Company for a licence to supply Montrose with electric light. The mover said that as the Board in committee had resolved to let the matter lie over in the meantime, he would not press his motion. He might add that his views were somewhat changed, simply because the particular company he took in hand had failed to assure him that the town would not be implicated to them as customers. It was agreed to leave the matter in the hands of the Lighting Committee.

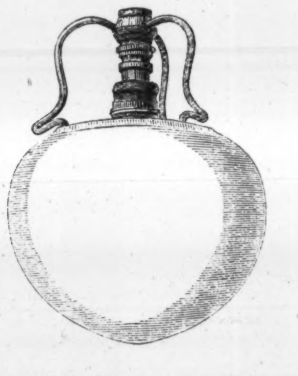
The Board of Trade gives notice that, in pursuance of section 5 of the Electric Lighting Act, 1882, the following rule has been made:—"That the time provided for by rules 4 and 11 of the rules made by the Board of Trade should be the first day of February, instead of two months from the date of the newspapers containing the first advertisement of the application.

Amongst the novelties at the forthcoming Electrical Exhibition at the Westminster Aquarium will be, says the *World*, some fancy dresses, the trimmings of which are all effected by electric light. M. Pilotel is now engaged upon the designs, which promise to be most original. Each dress is embroidered with fine wires, connected with innumerable small incandescent lamps. The main wire is carried down to the heel of the boot, which, coming into contact with a prepared carpet or floor, is charged with the electric current, and the trimmings of the dress are at once illuminated. It is intended to introduce these dresses on the stage in London, Paris, and Vienna. The inventor says their application is simple and attended with no danger.

The Burntisland and Crieff Town Councils at their respective meetings this week "declined in the meantime" to allow the Brush Electric Light Company to light their streets.

A special court of the Commission of Sewers having been convened in reference to electric lighting in the City, the clerk read the report of the select committee appointed to inquire into the necessary steps to be taken to enable this Commission to become the undertakers for the supply of electricity to the whole or any district of the City, under the provisions of the Electric Lighting Act, 1882. The committee reported that they had requested the Remembrancer to take the necessary steps to advise them upon certain points, and after an interview with some of the officials of the Board of Trade, the Remembrancer submitted a report, from which it appeared that a licence would in all probability be granted, making it compulsory to supply electric lighting in a small area, and permissive to supply outside that compulsory area, such permissive powers to be reasonably and fairly exercised at the discretion of the Commission, and it was suggested that the Board of Trade would not interfere, except in the event of real and serious neglect or unfairness. It appeared that, in order to receive the sanction of the Board of Trade, the licence must be accurately drawn and contain a perfect and complete scheme with price and full details as to the mode of supply, but it was suggested that a scheme based upon a contract with a reliable company for a limited number of years, would probably be accepted by the Board. The committee had since obtained copies of the draft provisional orders deposited by the three companies whose advertisements and maps were submitted to the Court on the 7th ult., viz.: The Edison Electric Light Company, the Metropolitan (Brush) Electric Light and Power Company, and the Pilsen-Joel and General Electric Light Company. The Edison and Brush companies sought permissive powers to supply the whole City, and severally specified an area in which they "shall" lay down and maintain distributing mains, and in which they "shall," so far as required by the local authorities, lay mains for public lighting. The Pilsen-Joel Company propose to take but a small area, over the whole of which the supply by them was to be compulsory. The committee were advised that a licence would take the same form as a provisional order, and they suggested that the Court should apply for a licence for permissive power to supply or contract for the supply to the whole City, and specify certain areas in which the supply shall be compulsory. It would be remembered that the Pilsen-Joel Company expressed their readiness to co-operate with the Commissioners in the event of their deciding to take the whole matter of electric lighting in hand, and they now submitted a letter from the Brush Company, stating that they would be willing to withdraw their application for a provisional order provided they could come to terms with the Commission on an equitable basis for carrying out the work on the Commissioners' behalf; and the Gülcher Company, who originally gave notice of their intention to apply for a provisional order, but had not proceeded, offered to enter into a contract with the Commission for lighting a district of the City. The committee therefore recommended that they be empowered to prepare a draft licence, framed on the principle of the Commission becoming undertakers, and of contracting with reliable electric lighting companies for the supply of electric lighting, and they asked authority to negotiate (by advertisement or otherwise) with the companies in respect of the areas in which the supply was proposed to be made compulsory, leaving the other portions of the City to be dealt with more at leisure, as circumstances and the experience gained in respect of the compulsory areas might dictate, by which means they hoped, within a reasonable time, to accomplish the lighting of the whole City at a minimum of cost to the ratepayers. The report was adopted, and it was moved, "That the Remembrancer and Solicitor be instructed to take the necessary steps to obtain a licence for electric lighting." This was seconded and agreed to.

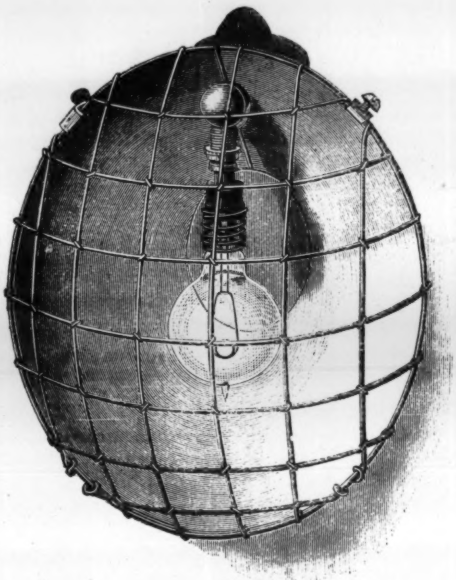
Fittings for Incandescence Electric Lamps.—Some special fittings for softening and reflecting the light of the Swan and other incandescent lamps have been recently introduced by Messrs. Faraday and Son, of Berners Street, W.



Our first engraving shows a four-inch globe with a polished outer surface, the inside being roughened, a treatment that has given satisfactory results in the auditorium of the Savoy Theatre.

This globe is supported by a holder with three springs, a decided improvement upon the usual "thumb-screw" holder.

The second engraving shows an eight-inch opal glass reflector, slightly concave in section. The central hole is just large enough for the lamp connections, the reflecting surface is thus considerably greater than the exigencies of gas or oil burners will allow. The spring holder is a modification of the preceding type.



The last illustration shows a tin or japanned reflector on a wall plate. The wire guard is "sprung" on, and is further secured by the two slotted screws below. This is found to be an efficient protection to the lamp for ship and factory purposes. We should think that these fittings will meet with general approval.

Gent's Patent "Suspension" Electric Bell.—We are favoured with particulars of a new electric bell, designed and patented by Messrs. Gent and Co., Electricians, Leicester, and of which we give interior and exterior views. On reference to the engravings it will be seen that the new bell is of somewhat novel construction, the object being to arrange the magnet poles with the armature so as to get the best results. The magnet-core for ordinary-sized bells—say, from three to five or six inches diameter—is only a quarter of an inch in thickness, each arm being wound with four to six layers of No. 26 or 28 silk-covered wire. The cores project beyond the ends of the spools holding the wire, and may be of the shape shown in the engraving, viz., filed off to an angle of 50 degrees, so as to present a large surface, or it may be simply flattened on its upper or lower side. The armature is of malleable iron, cast in such form as regards the upper part as to form a tongue, to which the spring is attached, the lower end being crossways to the same, so as to embrace the extended poles of the magnet.

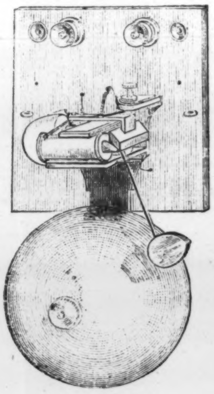


FIG. 1.

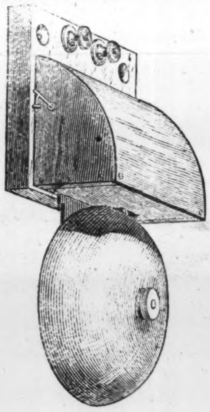


FIG. 2.

An important part of the arrangement is the spring, which is semi-eliptical in shape, about one inch in width, and tapering down towards the point of contact, and so arranged as to allow the armature to move slightly horizontally to the magnet as it approaches vertically; the spring is made of hard-rolled German silver. The contact breaker is fixed on a piece of neatly-shaped ebonite, screwed to a projecting bracket of the casting carrying the magnet and bells. The hammer is suspended between the arms of the magnet from the under side of the spring, so that its weight helps to increase the elasticity of the spring, and requires less power to move the armature when furthest from the poles, hence the makers have termed it a "suspension" bell. The power exerted from these small magnets, as arranged with the armature as described, is stated to be surprising. For large mining bells, with domes of eight or more inches diameter, a very little larger magnet is required than in the smaller bells, whilst a power is said to be developed equal to the large electro-magnets usually carrying one or two pounds of wire, consequently a much less battery power is needed to work them. The parts are all mounted upon a brass base, quite independent of the case, and are thus unaffected by changes of temperature or damp. The outer case is an improvement upon the ordinary form, the shape being semicircular, as shown in fig. 2, so that dust will not be so likely to accumulate and work its way within the interior. The new bell is constructed as an ordinary ringing bell, and suitable for every purpose to which electric bells can be applied. It is also made to continue ringing until stopped, as used for burglar alarms, or it is made as a single-stroke bell, for mining and railway purposes.

The Royal Society of Edinburgh.—The first ordinary meeting of the 100th session of the Royal Society of Edinburgh was held on Monday evening, Dec. 4th. The Right Hon. Lord Moncrieff, president, congratulated the society and its members on having arrived at that distinguished period of existence. He said it was but right that he should say that it would be a mistake to suppose that as this was the 100th session, that they were absolutely centenarian. The Royal Society charter bore date March, 1783, and he supposed, like other great institutions, had had an autumn session, so that this is actually the 100th session. In a few sentences he would go back to March, 1783, and look upon the long course that this society had run—a long and distinguished course all of them would say—seeing it was to their distinguished predecessors that they owed its glory and its present existence. There had been many speculations as to where the Royal Society came from, and, like all great and spreading rivers, its feeders had been examined and searched for with great assiduity. There was a Rankinian Club in Edinburgh towards the end of last century, and it became the foundation of the Royal Society. Then there was a select society—a debating club he thought it was—in 1750, when Dr. Robertson and the great men of these days practised their oratory, which they afterwards used with such effect, and they were told that to a general extent was the origin of the society. He thought, however, that the third had some claim—that was the Philosophical Society founded by Colin Maclaurin, the great mathematician. Undoubtedly it did exist till the period when the Royal Society was formed. He thought that was the fair parentage of the society. In 1783 these three streams met, and this institution was the result. At that time there were 104 members on the physical side and 114 on the literary side of the society. The physical class included Joseph Black, Clerk of Eldin, Sir John Dalrymple (Lord Hailes), James Gregory, James Hutton, John Playfair, Dugald Stewart, Lords Bute and Dundonald, Sir James Hall, James Watt, Dr. Small, of Dundee; Patrick Wilson; and in the literary class they found the Lord President, Chief Baron, and Lord Advocate, John Home, David Hume, Henry Mackenzie, Alexander Tytler (Lord Woodhouselee), the Duke of Buccleuch, Archibald Alison, Dr. Beattie, Edmund Burke, Lord Morton, Lord Hopetoun, John Hunter, of St. Andrews; Thomas Reid, Young, of Glasgow; Dalzel, and Mr. (afterwards Sir Robert) Liston. He thought they would agree with him that it would be difficult to find in any part of Britain or in any country out of Britain an assemblage of persons more distinguished in their respective spheres. From that time forward the society grew and prospered, until to be a member became one of the highest distinctions a man could aspire to. Whether they all came up to the mark of the great men he had alluded to he did not know, but they knew a great many things their predecessors did not know, and their predecessors knew a great many things that they did not know, and from the time the society started in 1783 till now it was a wonderful institution in point of invention and progress. He did not know, however, that the literary class had made that progress they might have looked for during that time. The President then concluded by wishing the society all prosperity during the next hundred years.

After several obituary notices had been read, Professor W. Robertson Smith made a communication on Dr. Guébhard's electro-chemical method of figuring equipotential lines (*vide* ELECTRICAL REVIEW, Vol. X., page 161). The experimental pieces shown were of great beauty, and justified Professor Tait's remark that "nothing could be finer than those laid before the Society to-night."

Breach of Contract.—The preliminaries of another lawsuit, says the New York *Herald*, have been commenced against Jay-Gould's Western Union Telegraph Company. Action was begun last July in the superior court by Mr. James H. Goodsell against that company for breach of contract. The claim is for 672,000 dols.—650,000 dols. for breach of contract and 22,000 dols. claimed to be due to Goodsell as having been paid to the Western Union Company and not turned over to the plaintiff according to contract. Answer was made by the Telegraph Company in August. The case is now on the calendar for trial, and it is likely to come up next month.

Social.—The members of the Aberdeen Postal Telegraph staff held their annual *réunion* in the Music Hall on Wednesday week. There was a large company, including members of the press and other friends. The chair was occupied by Mr. J. C. Taylor, superintendent, who, after the tea service had been got through, made some appropriate remarks. A successful programme of vocal and instrumental music was next disposed of, and with several hours' dancing a most enjoyable evening was closed.

Wayleave Charges for Telephone Lines, &c.—At a committee meeting of the Works Committee of the Dundee Police Commission on Monday the propriety of making a charge for tunnels constructed under the streets for the convenience of private parties and for wires erected overhead was brought under consideration, and it was agreed that the proposal should be entertained and a report made on the subject.

Winding up of an Electric Light Company.—The directors of the Dublin Electric Light and Power Company have decided that the undertaking be wound up voluntarily.

A Seasonable Gift.—The directors of the Bradford Telephone Exchange on Wednesday week connected the offices of the Charity Organisation Society with their Exchange. We are informed the connection is gratuitous, and that its value to the society during the pressure of the last week was inestimable.

The Direct Spanish Company.—This company, having acquired a special wire between London and Falmouth, works the cable to Bilbao direct from their Leadenhall Street offices.

The Telephone for Railway purposes.—The London and North-Western Railway Company are fitting several of the new signal cabins at Eccles Junction and Patricroft with telephones. This will be a much readier mode of communication than that of the single-needle instrument, which, with its many advantages, is still inconvenient when the signalman has to attend to his electric and semaphore signals. For nearly twelve months telephones have been on trial between various points on this company's system, and notwithstanding the severe tests they have been put to have universally demonstrated their superiority over the instruments previously used. The noise inseparable from the running and shunting of trains is found to cause no inconvenience, as it is rarely, and then but for a moment, that conversation cannot be carried on. There can be no doubt that the telephone is destined to play an important part in railway traffic working, in securing the public safety and the expediting of business.

Cable Repaired.—The cable between Marseilles and Barcelona is now repaired.

Lectures on Electricity.—A course of ten lectures on Electricity will be given, at the instance of the Society for the Extension of University Teaching, by T. W. Waghorn, Esq., R.N., in St. Jude's Schoolroom, Commercial Street, Whitechapel, E., on Tuesday, the 16th inst., and the nine following Tuesdays, at 8.15 p.m. The lectures will be illustrated by experiments, and intelligible to beginners. Each lecture will be followed by a class, in which the lecturer will answer any questions that may be addressed to him in elucidation of his lecture. The first lecture, on the 16th inst., is free. Further information may be obtained from the hon. secs., F. Rogers, 62, Nicholas Street, Mile End, E., and A. Milner, 54, Claverton Street, S.W.

On the Electric Spark.—Herren Fr. Wächter and Reitlinger have proved experimentally that the incandescent particles of the electrodes of which the electric spark is composed are only conveyed by the emission of positive electricity. On the other hand, the experiments of Herren Plücker, Gassiot, Hittorf, &c., agree to prove that under certain circumstances the current carries along exclusively particles of the negative electrodes. The recent experiments of Wächter have shown as follows the difference between the mode of translation of the particles of the anodes and of those of the cathodes :—

1. The translation of the particles of anodes in atmospheric air takes place under the pressure of a column of mercury of 4,500—10 millimetres ; that of the particles of the cathodes only under a pressure of 63—0,005 millimetres.

2. The quantity of the particles of the anode carried away in an equal time and under the same circumstances decreases directly as the atmospheric pressure, that of the particles of the cathode increases in the same proportion.

3. Under similar conditions the particles of the anodes are conveyed to a distance 3,400 times greater than those of the cathodes at a pressure of 63 millimetres.

4. Whatever may be the atmospheric pressure, the particles of the anodes are only detached from a surface relatively very restricted ; those of the cathodes are detached from an area more and more extensive in proportion as the atmospheric pressure diminishes.

5. The particles of the anode are detached constantly from the point of the anode nearest the cathode, those of the cathode are thrown off from its whole surface according to the density of the gas.

6. The emission of the particles of the anode is favoured by an electrode of a pointed or recurved form, that of the cathodes by a surface free from oxidation.

7. The direction of the movement of the particles of the anode depends on the position of the anode with relation to the cathode, towards which they move in the direction of the electric current according to the line of least resistance. The particles of the cathode move without exception in a direction normal to the surface of the cathode, and are influenced neither by the position of the anode nor the direction of the electric current.

8. The particles of the anodes can move in all possible curves ; those of the cathodes follow always a straight line and cannot describe a curve.

9. The magnet deflects the particles of the anode in the manner of diamagnetic bodies, and those of the cathode in the manner of paramagnetic bodies.

10. The particles of the anode are transported in the lucid and the opaque state ; those of the cathode in the opaque state only.

11. The dimensions of the particles of the anodes are measurable ; they are evidently detached in virtue of distinct mechanical shocks ; those of the cathodes are immeasurably small, and seem to be given off by evaporation.

12. Heating the electrode distinctly favours the transfer of the particles of the cathode, a fact not observed with the anode.

13. The particles of the cathode co-operate in the passage of the electric current from the electrodes towards the gaseous molecules ; it is not so with those of the anodes.

14. The detachment of the particles of the anode, according to the experiments of Wiedemann and Rühlmann, have a higher electric tension previous to the discharge than that of the particles of the cathodes.

The above facts, according to the author, seem to prove that the two electricities are qualitatively distinct from each other.—*Les Mondes.*

Explanation.—We recently published a paper by Mr. Nils Kolkin, which was credited to the proceedings of the American Association for the Advancement of Science. Information since received states that (although it was contained in the published list of papers of the Association) it was not read before that body.

OFFICIAL RETURNS OF ELECTRIC COMPANIES.

Australasian Electric Light, Power, and Storage Company (Limited).—The return of this company, made up to the 25th September, was filed on the 2nd inst. The nominal capital is £255,000, in £5 shares. 24,000 shares have been taken up and £3 per share called thereon, the calls paid amounting to £70,245 10s. 4d., leaving £1,754 9s. 8d. unpaid. Registered office, 4, Copthall Buildings, E.C.

Lancashire and Cheshire Telephonic Exchange Company (Limited).—The second return of this company, made up to the 25th September, was filed on the 18th ult. The nominal capital is £300,000, in £1 shares. 260,000 shares have been taken up and the full amount paid thereon. Registered office, 38, Faulkner Street, Manchester.

Anglo-Spanish (Brush) Electric Light and Power Company (Limited).—The return of this company, made up to the 29th September, was filed on the 28th October. The nominal capital is £200,000, in £5 shares. 8,899 shares have been allotted and £3 per share has been called thereon, the calls paid amounting to £24,279 10s., leaving £2,417 10s. unpaid. Registered office, 19 and 21, Queen Victoria Street.

NEW PATENTS—1882.

6193. "Incandescing electric lamps." T. J. HANDFORD. (Communicated by T. A. Edison.) Dated December 28.

6196. "Insulating conductors for electric lighting and other purposes." W. SMITH. Dated December 28.

6199. "Distribution of electrical energy for light, power, and other purposes." T. J. HANDFORD. (Communicated by T. A. Edison.) Dated December 28.

6218. "Improvements in the method of controlling the current in electric circuits by means of switches, resistances, and similar apparatus." J. JAMIESON. Dated December 29.

6226. "Improvements in galvanic batteries applicable to electric lighting, telegraphic, and other purposes." T. J. HOWELL. Dated December 30.

6228. "Telephonic and microphonic transmitting instruments." J. IMRAY. (Communicated by J. Ochorowicz). Dated December 30.

6235. "Electric arc lights or lamps." W. B. FITCH. Dated December 30.

6237. "Electric lamps or lighting apparatus." W. R. LAKE. (Communicated by R. Mondos.) Dated December 30.

1883.

1. "Dynamo-electric machines." F. J. CHEESBROUGH. (Communicated by E. R. Knowles.) Dated January 1.

2. "Storage batteries for accumulating electricity." F. J. CHEESBROUGH. (Communicated by E. R. Knowles.) Dated January 1.

3. "An improved system or combination of electrical apparatus and conductors to be used in the application of electricity to practical use and especially to domestic or household lighting." F. J. CHEESBROUGH. (Communicated by E. R. Knowles.) Dated January 1.

4. "Electric lamps of the arc type." F. J. CHEESBROUGH (Communicated by E. R. Knowles.) Dated January 1.

5. "Electric lamps or lights of the arc type." F. J. Cheesbrough. (Communicated by E. R. Knowles.) Dated January 1.

6. "Incandescent electric lamps." F. J. Cheesbrough. (Communicated by E. R. Knowles.) Dated January 1.

14. "Secondary or storage batteries." T. Rowan. Dated January 1.

17. "Electric lighting and power-distributing systems." S. Pitt. (Communicated by E. T. Starr and W. J. Peyton.) Dated January 1. (*Complete.*)

24. "Generation, storage, distribution, regulation, measurement, and utilisation of electricity and apparatus or means therefor, and methods or means to be employed in the construction of such apparatus or parts thereof." J. S. Williams. Dated January 1.

34. "Electric lamps or lighting apparatus." W. R. Lake. (Communicated by C. A. Hussey and A. S. Dodd.) Dated January 2.

36. "Apparatus for the generation and utilisation of electric currents." S. Z. de Ferranti. Dated January 2.

39. "Carbons for incandescent electric lamps." J. Wavish and J. Warner. Dated January 2.

46. "Manufacture of incandescent electric lamps." J. R. H. Williamson and E. Böhm. Dated January 3.

47. "Mariners' compasses combined with automatic registering devices for the same." S. Heimann. Dated January 3.

49. "Dynamo-electric machines and electric-motors." T. Rowan and S. Williams. Dated January 3.

56. "Apparatus for measuring electric currents." St. G. Lane-Fox. Dated January 4.

78. "Electric fire-alarm apparatus." W. C. Gordon. Dated January 5.

88. "Improvements in metal rollers for printing and embossing, and in arrangements for electro-plating such rollers." D. Appleton. Dated January 6.

108. "Primary voltaic batteries." G. G. André. Dated January 8.

120. "Magneto-electric machines." H. F. Joel. Dated January 9.

122. "Joints of sanitary and other pipes, and of electric wire conductors." A. B. Wren. Dated January 9.

125. "Improvements in electrical fire-arms and ordnance, and in cartridges therefor." E. A. Monfort. Dated January 9.

156. "Apparatus for controlling, indicating, and arresting the flow of electric current." W. M. Mordey. Dated January 10.

ABSTRACTS

OF PUBLISHED SPECIFICATIONS, 1882.

2237. "Microphones." J. H. Johnson. (A communication from abroad by Doctor Arsène D'Arsonval, of Paris.) Dated May 11. 6d. This invention relates to microphonic transmitters or apparatus, and consists of certain improvements in the construction and arrangement and mode of supporting this apparatus as hereinafter described. According to this invention a manganesian agglomerate or compound, containing bioxide of manganese, is employed to form the sensitive part of the apparatus in place of the carbon ordinarily used for this purpose, and the sensitiveness of the apparatus, that is to say, the pressure exerted by the moveable part upon the stationary part, is regulated or controlled by a magnet the position of which is capable of being adjusted at will. The influence of weight in connection with this adjustment being thus dispensed with the apparatus is rendered capable of being moved or placed in any convenient position without affecting its action or working. The apparatus is, moreover, supported in a peculiar manner, whereby all shocks and vibrations are prevented from being transmitted to the working parts, and the said apparatus is thus enabled to be employed in workshops, mines, and other similar places where it is liable to be exposed to frequent shocks and vibrations.

2256. "Regulating and directing electric light." H. Wilde. Dated May 13. 2d. Consists of an improvement in the regulator described in the specification of letters patent of the 19th day of February, 1873, No. 618, which improvement is also applicable to other electric light regulators. When the electric light produced by alternating currents is employed in a projector with the carbon points in the same straight line, the arc travels round the points of the carbons, and a portion only of the light is utilised in the projector. In the present improvement the arc is directed to the front of the carbon points, and is also prevented from travelling round them by means of one or more electro-magnetic coils placed in proximity to the arc, and in the circuit through which the light-producing current is transmitted. These coils may be of the helical or convolute form, either with or without iron cores, and they may be applied to other forms of regulator besides that described in the above-mentioned specification. The electro-magnetic coils may also be used with or without soft iron, for directing the arc to the front of the carbons when continuous or direct currents are used for producing the light. (*Provisional only.*)

2263. "Secondary batteries." A. Tribe. Dated May 13. 4d. Relates to improvements in secondary batteries, and consists, firstly, in the employment for the production of the foundation plates or supports for the negative element employed in such batteries of metals which have been to a greater or less degree converted into sulphides, arsenides, oxides, phosphides, or other compounds not easily acted upon by electrolytic action. Plates or supports so prepared are employed as foundation plates or supports for the negative elements in secondary batteries. The invention further relates to the preparation of a positive element to be employed in secondary batteries, and consists in the use of compressed consolidated or agglomerated precipitated lead, or of lead in a finely divided condition, which precipitated lead or lead in a finely divided condition is submitted to pressure in order that a porous compressed agglomerated or consolidated element may be obtained capable of being employed as the positive element in secondary batteries.

2270. "Galvanic batteries." R. H. Simons. Dated May 15. 4d. Relates to improvements in galvanic batteries, and has for its object to secure far greater constancy, combined with increased intensity, in such batteries, than has hitherto been practicable. Such improvements consist in using cylindrical, square, or flat plates of graphite, together with zinc, iron, or other suitable metal, and two or more fluids to excite the said plates. The graphite in the porous or neutral cell is saturated with a combination of alkalies and acids in solution, and the spiral metal plate is immersed in a solution composed of one or more silicates, in combination with dilute acid.

2286. "Electric lamps." R. Kennedy. Dated May 16. 2d. This invention, which relates to improvements in electric lamps of the arc type, is a further development of the invention for which letters patent were applied for by the said Rankin Kennedy on the 13th day of March, 1882, No. 1199. The present improvements consist in substituting for the soft iron tube, described in the Provisional Specification accompanying the said application, a tube or core of material other than soft iron, such as brass, copper, wood, vulcanite, and other suitable materials, and it is to be understood that the solenoids used in the said arc lamps may be of iron or other metallic wire.

2288. "Electric lamps." E. L. Voice. Dated May 16. 6d. If two or more rods or bars of iron be placed in a hollow bobbin and magnetised by a current of electricity, they will have a tendency to place themselves as far as possible from each other with a force proportional to the strength of the current, by reason of the fact that for the time being they are converted into magnets, with like poles adjoining or adjacent to each other, and in consequence of the well-known law that like poles repel each other, the action is explained Now the inventor utilises this principle in the construction of electric lamps by placing the electrode or electrodes, or carbon-holder or holders, in an iron core of an electro-magnet, constructed of two or more rods of iron, which are made to surround the said electrode or carbon-holder. At the ends of the iron rods, or at a distance from their ends, they are hinged, the said hinge or hinges forming a fulcrum, instead of which the said iron rods could be fixed to a brass socket having a pivot and extension pieces to bite, or regulate the biting of the carbon-holder. Fig. 1 in the accompanying drawing shows the solenoid in section, and the iron rods forming the core in elevation; A is the main circuit coil, and B the shunt coil; C, C are the iron rods forming the core; O, O are the extension pieces which are made to form part of, and are rigidly fixed to each iron rod respectively. These said extension pieces may be of iron but preferably of brass, which in that case would have small blocks of iron, I, I, at or near their ends; the advantage of these blocks will be presently explained. P, P are posts surrounded by spiral springs; these posts are made to be adjustable, that is, they may be fixed at a greater or lesser distance from the iron core. This is obtained by having an elongated hole or slot in the frame, F, a top view of which is shown in fig. 3, S being the said holes or slots. The said posts for supporting the springs are fixed by suitable shoulderings and nuts. The fact of these posts being adjustable transversely enables the biting power of the iron rods constituting the core to be regulated, owing to the upward pressure of the springs tending to counteract the repelling force of the two iron rods, this force varying as the posts are closer to or further from the iron core. Fig. 2 shows an elevation of one of the iron rods forming the core of the magnet. Fig. 4 is a sectional drawing of the bottom of the core and Fig. 5 a section across near the top. The iron blocks, I, I, may be made to be adjustable on the extension pieces, O, O, but they are preferably fixed. If the lamp is placed in circuit the iron rods move apart at

FIG. 1

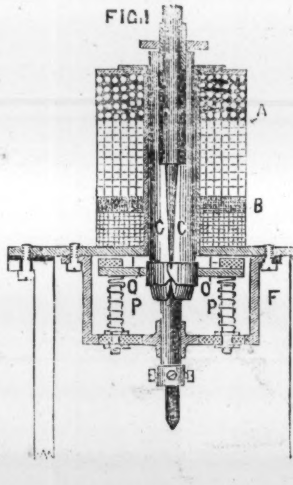


FIG. 2

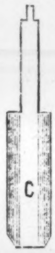


FIG. 4.

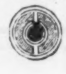


FIG. 5.

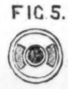
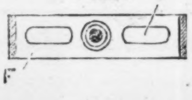


FIG. 3.

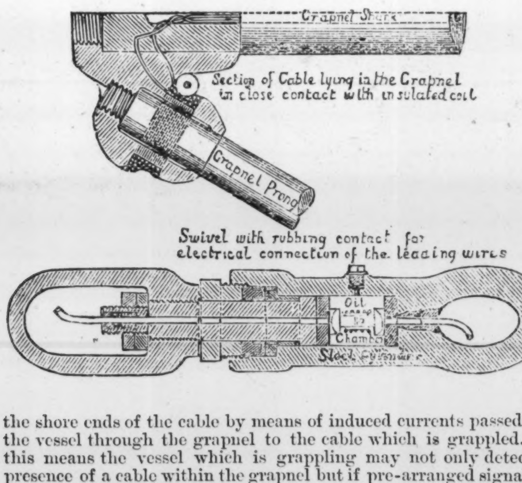


the top, and consequently bite the carbon-holder at the bottom, at the same time forming the arc. If however the lamps are working in series, the varying resistance in the circuit which occurs on that account is compensated for in the following manner. As soon as the arc gets too long, the increased resistance causes the shunt coil, B, to convey more current, whose increased magnetic effect exerts an attractive power on the iron blocks, I, I, while the core has a tendency to drop, but that cannot happen without its first releasing the electrode by reason of the combined effect of the upward pressure of the springs and the increased influence which the shunt coil, B, has on the blocks, I, I.

2293. "Insulating, covering, and coating wires used for electric lighting &c." A. Shippey and R. Punshon. Dated May 16. 2d. The object of the invention is to make a suitable material to cover or coat wires used for electric lighting, telegraph, and other purposes, where insulated wire or wires is or are used or required. The method adopted or used is to take about equal parts of powered glass and soda silicate, mix these two materials intimately together, and whilst moist coat or cover the wire with them. This coating may be applied several times and in some classes of wire, where desirable, after the wire has received such a coat or covering hereinbefore stated of the thickness required, the covering is allowed to dry and a thin tape of cotton or asbestos paper or other suitable material is soaked in melted paraffine, ozokerit, or other known waterproof material. When still hot it is wrapped round the wire already covered or coated by the above insulation. The tape covering is then allowed to dry and a solution of any waterproof material is laid on the covered or coated wire; by preference a solution of gutta-percha dissolved in Benzole is used.

2298. "Apparatus for operating sewing machines by electricity." W. R. Lake. (A communication from abroad by J. Kearney, of America.) Dated May 16. 2d. Relates to the employment of electricity for the operation of sewing machines and comprises the combination and arrangement of mechanism or apparatus hereinafter described. In applying the said invention to a sewing-machine of well-known construction, the inventor provides an ordinary battery connected with electro-magnets, whose armatures are pivoted in a frame or standard; he also provides connecting rods for connecting the armatures with the needle-lever, the lower needle and the feed. These connecting rods are attached directly to the armatures and operate the parts of the machine in the ordinary manner, that is to say, the said battery being connected with the coils of the electro-magnets they impart vibratory motion to the armatures in the ordinary manner and thereby cause the connecting rods to transmit motion to the needle-bar, the lower needle and the feed. A connecting bar or arm is extended from one of the armatures, which arm reverses the current passing from the battery through the coils of the electro-magnet, when required. (*Provisional only.*)

2311. "Submarine cable grapnels, &c." Sir James Anderson and W. C. Johnson. Dated May 17. 6d. To attain the object of the invention. First—the grappling rope is made to contain one or more insulated electrical conductors, the "inboard" ends of which are connected to suitable batteries, telephones, galvanometers, or other suitable apparatus for generating and measuring an electric current. Secondly. Arranging the conductor or conductors within or near that portion of the grapnel which comes in contact with the cable which is grappled with. Thirdly. The arrangements provided on the grapnel for acting upon the electrical conductor, so that when the cable is received within the prongs of the grapnel the conductor may be punctured, cut or otherwise acted upon either mechanically or electrically by conduction or otherwise, so that the presence of the cable which is grappled may be indicated on board the vessel or the presence of the grapnel may be made evident by signals received at the shore ends of the cable by means of induced currents passed from the vessel through the grapnel to the cable which is grappled. By this means the vessel which is grappling may not only detect the presence of a cable within the grapnel but if pre-arranged signals are sent from the shore ends the operator on board the repairing vessel may know that the desired cable is grappled, or failing to receive the signal he may be aware that the grapnel has hooked a wrong cable. Swivels are provided in the grapnel rope as required to allow the "turn" to circulate. These are made with contacts to keep up electrical connection and the internal parts are preferably enclosed in a suitable oil or like substance, so that there need be no air spaces to protect from the pressure of the surrounding water. The inventions are shown by figs. 1 and 2.


Grapnel Shank
Section of Cable lying in the Grapnel in close contact with insulated coil
Grapnel Prong
Swivel with rubbing contact for electrical connection of the leading wires
Oil
Chamber
Steel Cylinder

2318. "Electric motors." J. A. Cumine. Dated May 17. 2d. This invention relates to a novel arrangement of electro-magnets in the construction of an electro-motor, whereby simplicity and efficiency are obtained, the fixed and revolving portions of the motor are all in the same electric circuit, and there are only two ends of wire forming the circuit through the motor attached to the commutator the electro-magnets are of the bar type, but so arranged by being bolted on to circular discs that two bars form the equivalent of a horse-shoe electro-magnet. One of the simplest forms of this motor consists in three pairs of the electro-magnets or three horse-shoe electro-magnets, bolted three on to each side of a circular disc of iron. They are so arranged that the space between the legs or limbs of each magnet is equal to the diameter of the end of the limb; the disc, supporting on each side of itself the electro-magnets, is open in the centre of its diameter, so that a revolving shaft can pass through; this disc is bolted down to the main frame of the motor, or is otherwise attached thereto; the main frame carries bearings on each side of the centre disc, in which runs a shaft; on this shaft are two discs; each disc carries a like number of magnets as are on each side of the centre disc, the ends of the magnets on the revolving discs are in the closest practical proximity to the ends of the magnets on the fixed disc; they are so coupled up that the magnets facing each other are of opposite and similar polarity alternately, so that when the motor is once started, the rotation is kept up without loss through attraction or repulsion in the wrong direction. Every time the revolving magnets pass the fixed magnets centres their polarity is changed, and during the change the current is momentarily interrupted in the fixed magnets this action may be reversed.

2335. "Fittings for electric lamps." C. Defries. Dated May 18. 6d. Relates to a very simple construction of circuit controller for electric lamps, whereby the inventor may establish and break electrical communication with the greatest facility and certainty; also to an improved construction of socket or holder for the incandescent lamp affording (amongst other advantages) that of preventing the breaking of the circuit by the accidental rising of the glass bulb from its socket.

2336. "Dynamo or magneto-electric machines and apparatus for lighting railway carriages, &c." T. J. Handford. (A communication from abroad by W. A. Stern and H. M. Byllesby, both of America.) Dated May 18. 6d. The primary object of this invention is the lighting of railway carriages, or cars by the combination of a generator, storage batteries, and switches for operating the same, and secondly to change the circuit connections of a dynamo-electric machine automatically and in such a manner that the polarity of the field magnet of the generator remains the same, and the current in the main line always flows in the same direction, no matter which way the armature may be revolved; this allows the armature to be revolved by a connection to the wheels of a carriage, car or locomotive, and the parts work equally well when the locomotive, carriages or cars are going in either direction.

2348. "Incandescent electric lamps." S. H. Emmens. Dated May 18. 6d. Relates to electric lamps dependent for their luminosity upon the incandescence of a bridge or conductor of carbon or other suitable substance of high electrical resistance, in vacüo, or in petroleum, bisulphide of carbon, or other suitable gas or vapour. It is designed to give a more diffused light than is obtainable from the known types of lamps, and to afford a means for the regulation of the quantity of light from any single lamp. These objects are effected by enclosing in each bulb or globe a series of small incandescent conductors in place of the single incandescing conductor hitherto used. This series is conveniently arranged in continuous circuit and around a circle, and thus affords an equable and well-diffused light. By the employment of a suitable switch or short-circuiting device interposed between the lamp and the leading wires, one or more of the incandescing conductors may be cut out, and the luminosity of the lamp thus regulated.

2349. "Electrical apparatus." S. H. Emmens. Dated May 18. 6d. Relates mainly to a novel construction of core for electro-magnets, and in the second place to the application of so-constructed magnets to electrical apparatus, to certain structural improvements therein, to a battery to be used in combination therewith, and to application of the said magnets to arc-lights. The improved cores are built up of a number of coils of insulated copper or other suitable conducting wire, interspaced with iron wire parallel to their axes, the whole arranged lengthwise. By this construction of magnetic core it is proposed to increase the magnetic force of the core as a whole and to augment the electromotive force of the induced currents to an extent unattainable by the known construction of core of solid metal or bundles of straight wire.

2364. "Dynamo-electric machines." R. Werdermann. Dated May 19. 6d. Relates to improvements in machines or apparatus for producing or generating electric currents, and has for its object the production of currents of great magnitude. The said machine or apparatus is constructed as follows, that is to say, between a series of poles or polar extensions, say, six, eight, or more is arranged a revolving armature consisting of a bobbin or bobbins mounted on a revolving shaft. The bobbins consist of a core of magnetic material, The inventor prefers an alloy consisting of—Iron, 92 parts, and Nickel, 8 parts, or of Iron, 92·00 parts, Nickel, 7·10, and Cobalt, 0·90 parts by weight. The said core is made of a piece, or a number of pieces, or is formed of wire, and it has the general shape of a ring, cylinder, or disc. This core is provided with helices of insulated wire of copper or other good conducting material wound in a direction parallel to its axis so as to form a series of small bobbins; the terminal end of the wire of each bobbin being soldered or otherwise connected to the end of the next succeeding bobbin. To each of the junctions of two consecutive bobbins is connected a metallic conductor, and these conductors are insulated from each other and arranged in such a manner as to give to the revolving armature the form of a cylinder or a disc, and the said conductors are either fixed on the shaft or on the drum or boss of the armature and properly insulated. The said conductors revolve with the armature and come in regular succession into contact with fixed metal springs, rollers, or brushes by which the electric currents generated in the bobbins are collected and conducted outside of the machine. All of the said collectors are fixed on a ring or disc of insulating material which is so formed and arranged that it can be adjusted as required to insure the collection of the currents at the most convenient points. The magnetic poles which surround the revolving armature are of alternating polarity, so that supposing, for instance, their number to be sixteen, namely, eight north poles and eight south poles, there will be eight magnetic fields and sixteen reversals of the current in each section or bobbin during the revolution of the armature. The polar extensions in some cases have such a form in tranverse section as to nearly enclose the inner series of bobbins. The collecting brushes, springs, or rollers are connected with sixteen terminals placed on a plate or board at any convenient point near the machine, and these sixteen terminals are connected between themselves and to two other larger terminals in such a manner that the sixteen different currents which are generated in the bobbins may be joined either in series, or side by side, or partly in series and partly in parallel circuits; or the said sixteen currents may be utilised independently of each other.

2370. "Electric arc lamps." J. Brockie. Dated May 19. 8d. The first part of this invention relates to a new construction of electric lamp in order to prevent the overfeeding of the carbons. For this purpose the inventor uses a differential solenoid which directly operates the bottom carbon holder; the top holder is preferably racked, and gears into a pinion, which pinion has a large escapement or star wheel upon its axis; a lever carrying an anchor is placed over this wheel and by its movement permits only one tooth to escape at a time; but the inventor constructs this anchor so that the escape wheel cannot oscillate it—the anchor must be moved before the escape wheel can turn. This escape lever is geared to the core of the differential solenoid so that when the core arrives at a certain point a tooth will be permitted to escape and the carbon therefore be permitted to feed a well-defined amount, this feed will then cause the core to separate the carbons and another tooth of the wheel to escape, but this second tooth may represent a much smaller feed than the former. When the current ceases the detent is taken out of gear altogether and the carbons can thus meet. The second part of this invention relates principally to improvements in the construction of lamps having two or more pairs of carbons, and to various mechanical details in lamp construction generally.

2428. "Telegraph printing and time-regulating apparatus." J. Imray. (Communicated from abroad by A. A. Knudson, of America.) Dated May 23. 6d. Relates to a combination of telegraph printing instruments with time-pieces corrected and controlled in their movement, so that a number of these instruments connected by conductors to a transmitting instrument shall act in unison to print upon a moving strip at each station a letter or other symbol and a succession of such symbols as determined by the transmitter.

2451. "Telephone transmitters." C. Moseley. Dated May 24. 2d. These improvements relate to the telephone transmitters in which carbon electrodes are employed in combination with powdered carbon for which Letters Patent were granted to Alexander Marr, dated the twenty-first of June one thousand eight hundred and seventy-nine, No. 2497. In carrying out this invention the inventor mounts upon the back of the diaphragm or tympan one or more cells or shallow boxes to contain the electrodes and the powdered carbon. The carbon electrodes may be attached to the back of the diaphragm with an insulated space between them, or one only of each pair may be on the diaphragm, the other being on the opposite side of its box. In either case the circuit between the electrodes is completed by the powdered carbon which acts in conjunction with the electrodes as a tension regulator. The diaphragm may be of wood or other suitable material, but it is preferred to make it of sheet ebonite. Instead of carbon any other substance possessing similar qualities may be used. (*Provisional only.*)

CITY NOTES, REPORTS, MEETINGS, &c.

The Phœnix Electric Light and Power Company (Limited).

An adjourned meeting of this company was held at Cannon Street Hotel, in the City of London, on Friday, the 5th January, 1883, at two o'clock p.m. There were present about 50 shareholders, exclusive of the board, &c. Dr. Clerihew in the chair.

The Chairman stated that the directors had considered the matter since the meeting on the 22nd December last, and they could come to no other conclusion than that the company must be wound up.

Mr. Rawlings, the solicitor to the company, stated that he was not present at the last meeting, but he was now present for the purpose of advising the shareholders upon their legal position, having especial regard to the circular issued by Messrs. Hough and Whiteley, which, however, he did not propose to discuss in detail. The question was as to the winding up of the company, and how it was to be done. They did not propose to appoint a liquidator at this meeting, but there could be no two opinions about the winding up being inevitable. That being so, he contended that a voluntary winding up was the most inexpensive; and, if found necessary, they could afterwards go to the Court. There were three methods of winding up a company. Firstly: A winding up purely by the Court. Secondly: Voluntary winding up, with supervision; and, thirdly: Voluntary, simply. In his opinion the voluntary winding up was the most expedient, and they could get the supervision of the Court hereafter. He mentioned that the expressions in the circular issued by Messrs. Hough and Whiteley were not warranted by facts, and strongly urged the shareholders to support the resolution.

The Chairman proposed the resolution, and it was seconded by another director.

Mr. C. P. Whiteley then stated that the solicitor had just informed them that there were three methods of winding up the company, and had advised them to adopt the voluntary method. This would be putting the power in the hands of the directors, the very thing that he had been protesting against all along and he thought the wrong thing to do, as the directors were not the proper persons to be intrusted with the charge of the winding up. He wished to put before them one or two facts in addition to those already brought to their notice. The most important was a statement in the prospectus that the directors had had an offer of £40,000 for the use of patents in Scotland, and further proposals to the extent of £145,000. He said most advisedly that not one of these offers was *bonâ fide* or tangible, or one that should have been entertained by the directors, and put forth in the prospectus to induce the public to subscribe their money. These quasi-offers were contained in three letters, and some of the shareholders had seen them, and had stated to him that the offer for Scotland was a shadowy thing restricted by conditions which nullified the offer; in point of fact it was no offer at all. One of the firms that were in negotiation with the directors shared a small back office in Walbrook on the third floor with some other person. Their names were not in the directory, but however respectable a firm they might be, their position was not such as to warrant the directors obtaining the shareholders' money on the strength of their offers or negotiation. Now a petition had been filed in July last, by Messrs. Foster, Hight and Company, to wind up this company. The petition died a natural, or unnatural, death; but who were the petitioners? They were actually the auditors of this company. Now the shareholders had not been informed of this petition being presented by the company's own officers, nor given any explanation of its sudden withdrawal. He wished the shareholders to particularly notice the heading of the first prospectus; it is there printed in red ink as follows: "Professor Varley, the greatest recognised authority on electricity in the world, says, 'In my opinion it is superior to all existing incandescent lamps, and I think it will prove more durable than any now known.'" In the second prospectus, issued on the attempt to re-verify this Phœnix, the same certificate of Professor Varley is quoted, but differently worded, as follows: "I have examined the invention and the mode of its construction. *I have not had an opportunity of submitting it to a test of long duration; but,* in my opinion, it is superior to all existing incandescent lamps, and I think it will prove more durable than any now known." The shareholders would notice that there was a material suppression in the certificate in the first prospectus. Why was not the certificate printed in the first prospectus in its original form instead of a vital portion being taken out, that portion being a qualification of opinion which gave the certificate a totally different complexion? He regretted to have to state another fact. The secretary had actually offered fully paid-up shares to one of the shareholders at seven shillings each. [The secretary interposed and said that the correspondence relating to that offer ought to be read.] Mr. Whiteley said he had not that correspondence, but it was open to the secretary to offer any explanation he chose. The fact, however, could not be denied that the secretary of the company had actually offered to procure £1 paid-up shares at seven shillings each. He was happy to be able to inform them that 111 shareholders were in favour of the petition, representing 8,270 shares; and inasmuch as holders of 2,000 shares were in litigation with the company, it was evident that the holders of over 10,000 shares at the least were opposed to the directors being intrusted with their concerns any longer. It was also a fact that the directors had offered to return one of the shareholders the money he had paid, because (he supposed) the shareholder had pressed them too hard. It came to his knowledge only at this meeting that the solicitors of the company had been changed. Why was this? and what did it mean? There were also some very curious facts to be disclosed in reference to the applicant for 1,000 shares whose promissory note the directors accepted for deposit and allotment money. He contended this was a wrong thing to do, but would say no more about it now; in due course the facts would doubtless appear. He, in conclusion, urged the shareholders to support the petition for winding up, and, without further comment, he would move an amendment to the resolution, namely, "That this company be wound up compulsorily under the direction of the High Court of Justice upon the petition already presented by Messrs. Hough and Whiteley."

Mr. Taunton stated that he took 100 shares in the company solely on the faith of the prospectus stating that an offer to purchase the concession for Scotland for £40,000 had been received, and if the directors would satisfy him that this offer was a straightforward, satisfactory, business-like, and tangible offer, he would vote for the voluntary winding up, but if they did not satisfy him on that point he should certainly vote in support of the petition. Out of an issue of 125,000 shares only 13,000 odd had been subscribed for, and if all calls had been paid there would only have been a little over £13,000 cash to pay £30,000 on account of purchase, and £5,000 commission to promoter. How was the company to pay these amounts out of £13,000? It seemed to him that when the directors had only received applications for 13,000 shares they ought to have returned the application money. He added that he had called on the secretary some time since and explained his views, and had gone so far as to contemplate suing for a return of his money. He called upon the directors to prove that the Scotch offer was a *bonâ fide* and tangible one.

Mr. Cameron, one of the directors, said he had been asked to join the board, and he had examined the lamp which he considered an excellent one. He had looked at the Scotch offer and thought it a good one. He had paid up his calls, and he hoped the shareholders would not impute bad motives to him. Messrs. Wilkes Brothers had made proposals for concessions, and he had every reason to believe they would have carried them out. He would explain the petition presented by Messrs. Foster, Hight & Co. The petition had been presented by these gentlemen as they considered they were entitled to certain fees which the directors did not consider they were compelled to pay, and they used this method as the most summary one. The matter, however, was satisfactorily arranged. He would state to the meeting the position of the company on the 30th November. The number of shares taken up was 13,691. The directors had received cash £9,857, and there remained unpaid calls to the extent of £3,834. The cash then remaining in hand was £737. Mr. Jones, the vendor, had been paid £5,800, and there had been spent £183 in plant, &c., £111 for office furniture, £687 in working expenses (exclusive of advertising), £200 legal expenses, and £2,000 advertising the company; he added that the directors had a considerable stake in the concern, and three of them stood to lose £500 each. The patentee had undertaken by agreement to return the amount of purchase-money in the event of re-sale of the lamp, so that all things considered, it seemed to him that it showed a very good prospect of 15s. in the £ to be returned to the shareholders.

Mr. Hough wished to ask how it was that the Fitzgerald lamp, after all that was said about it in the prospectus, had not been found sufficient, and that they had been forced to buy another? Also what amount the directors considered should have been allotted in shares in face of the liability they started with?

A Director stated that there were no liabilities when they started; the balance of the purchase-money was to be paid only on a further issue of shares, and by an agreement of the 1st June the vendor agreed to wait until the money came in.

Mr. Hough again asked the directors whether, considering that they estimated the dividend at 15s. in the pound, they were prepared to make some definite proposition to the shareholders to settle the matter? If they felt so sure of a satisfactory state of affairs surely they could make some proposition which could be accepted.

The Chairman stated that the directors had considered the matter since the last meeting, and they were not prepared and not in a position to make any offer to the shareholders beyond the proposal that the company should be wound up voluntarily.

Mr. Tompsett referred to Mr. Cameron's remarks as to the patentee agreeing to return the amount of purchase-money, and called for the production of the agreement. (The agreement, however, was not forthcoming.)

Mr. Tompsett proceeded with his remarks and stated that if this money was to be returned to the shareholders it would come to them under a compulsory winding up the same as under a voluntary winding up, and he contended that the winding up should be on strictly legal lines. The management of the directors in the past had not impressed confidence in them for the future. The solicitor to the company had explained the different modes of winding up, and had told the shareholders they ought to consider the expense and adopt a voluntary winding up as being the most inexpensive. He reminded them of the old adage "the cheapest is often the dearest." For his part he did not think a voluntary winding up would prove the cheapest, at all events a compulsory winding up was the most straightforward, and one that would bring all the circumstances connected with the company to the light. He concluded by urging all the shareholders present to vote against the resolution.

The following amendment was then moved by Mr. Regghi and seconded by Mr. Hough, "That the company be wound up compulsorily, under the direction of the High Court of Justice, upon the petition already presented by Messrs. Hough and Whiteley."

After some little further discussion the chairman put the amendment, when about 45 voted in favour of it. The directors, Mr. Waters (the promoter), and one shareholder voted against it. The amendment was therefore carried on a show of hands, but the chairman demanded a poll and stated that the poll would be kept open till four o'clock. The meeting then broke up till a quarter-past three. At four o'clock the chairman declared that the result of the poll was that the amendment was negatived. There were then present three directors, the promoter, and five shareholders. A shareholder requested to know the numbers voting on the poll, but the chairman refused to give the information.

A scrutiny of the poll was then demanded, but this the chairman also refused.

The Chairman then moved the original resolution: "That the company be wound up voluntarily."

The three directors and the promoter voted in favour of the resolution and the five shareholders against it, and the chairman declared the resolution carried.

The shareholders protested against the refusal of the directors to give them statement as to the poll, which was so at variance with the nearly unanimous voting on the show of hands at the meeting.

The Western and Brazilian Telegraph Company (Limited).

ON Thursday afternoon the tenth ordinary general meeting of the shareholders of the above-named company took place at Cannon Street Hotel, Sir Henry Drummond Wolff, G.C.M.G., K.C.B., M.P., chairman of the company, presiding.

Mr. R. M. Cunningham, secretary, read the notice convening the meeting, after which

The Chairman said: The report having been taken as read, I have now to lay before you the present state of the company, and to explain to you, as well as I am able, the proposals that are to be laid before you. I will first refer to the negotiations with the Brazilian Government, which I mentioned last year as then being carried on by our secretary. The negotiations could not be considered as concluded. The question is one of great delicacy, affecting not only our relations with the Brazilian Government, but also our relations with other Telegraph Companies, and as it would take some time to carry them out we thought it better to place our house in order here, as we thought by so doing we should strengthen our position in these negotiations. Last year a commission was appointed by the Brazilian Government in order to look into the proposals and negotiations, and the Government and the Brazilian people looked with considerable favour upon our proposals. In a country which was subject to constant changes of Government, and where questions of this kind are submitted to the popular assembly, it appeared to us that the negotiations would take some considerable time before they could be carried out. We still believe that the Brazilian Government look favourably upon our proposals; at some time or other not remote we shall be able to recommence negotiations with the Government. Having now touched upon a subject not contained in the report, I will go *seriatim* through that document. In the first place, we have opened communication with Maldonado and Ceara, at which former place there was no station. The Government of Uruguay have given us a subsidy sufficient to cover our working expenses. Therefore we hope there may be profit from it; at any rate, there can be no loss. With regard to Ceara, we have opened a new station at that important and rising place, by dividing the line between Maldonado and Ceara, thus dividing the section which originally went from Maldonado to Pernambuco. We have entered into a contract for repairing and purchasing a new ship. The necessity for this was suggested by the fact that our lines are 3,700 miles in length, and that much delay was caused if two interruptions occurred at the same time at opposite ends. The price of the steamer would soon be recouped by the more speedy manner of executing repairs. The earnings of the company have decreased slightly, but the total receipts are comparatively satisfactory. The working expenses have been reduced £8,500, and the maintenance for the year has been reduced by £10,000. One great cause of the bad earnings of this company arises from the fact that the cable originally laid was not suited for the purposes to which it was turned. A deep-sea cable was laid in shallow waters, and was exposed to risks to which a sheathed cable was not exposed. We have found that wherever there has been a sheathed cable the repairs have been very insignificant and very rare. The money spent last year has been on actual renewal of the line, and the result is to a certain extent satisfactory to the company; for we have now 2,500 miles of new cable out of 3,700 which form our system. Thus two-thirds of the cable has been entirely relaid, and we may be considered to have a new lease of that line of cable. We have at the present time money by us, by which we could relay the rest of the line. We hope that may not be necessary, as our cables are now in a very fair state of repair, and will probably require very few repairs for the next few years Although the earnings during the past year have shown a small reduction, the traffic shows an increase from October to December of a little over £3,000. (Hear, hear.) We have now finally closed litigation by receiving a sum of money; and a question will be put to you with a view to the reduction of capital for the purpose of paying dividends. We have applied to eminent counsel, the Attorney-General and Mr. Horace Davey, as to the manner in which we should use the recovered money, and the course which we are now pursuing has been recommended by those gentlemen. It is proposed to reduce the share capital by £5 per share, which will include the loss on the central station, depreciation of instruments, repairs of shipping, and renewals of cable, which have not hitherto been dealt with. If you consent to this reduction it will enable us to declare a dividend equal to 3 per cent. on the whole reduced capital, at the same time placing £12,000 to the reserve fund and, carry forward a balance. I think this course will recommend itself to your judgment. Henceforth we shall have a real capital of £15 per share, on which I hope we may be able to keep up our dividend. In fact, by the recovery of so large a sum of money as that which now stands to our credit, we shall be able to fairly expend sums of money on renewal out of those sums which have hitherto been very unfairly placed upon revenue, which the exigencies of the case forced us to place upon that account. The next point to be submitted to you is the question of the division of the shares. This division has been pressed upon us in an influential manner by many shareholders. It is a proposition for the division of the shares into preferred accumulative shares and deferred shares. Those proprietors who prefer to keep their shares as at present will be paid dividend on the £15 shares. There will be nothing compulsory in the matter. We have received a large number of proxies from those who desire to hold the option given them; and the dividend will only be payable after the court has decided to ratify the resolutions, if we pass them. I hope we shall be able to keep up our dividends. Notwithstanding the unfair competition of the Brazilian land lines, we do not do so badly as might be anticipated. I beg to move that the report and accounts be adopted.

Mr. W. S. Andrews (one of the Board) seconded.

Mr. Price thought it very proper to put the sum of money to renewal account.

The Chairman: We were told that it was the only means to which we could apply the money. We could not divide it amongst the shareholders.

Captain Cotton said he should like to ask what the decrease of the last fourteen days meant.

The Chairman said it was the result of the fluctuation in business and the holiday at Christmas time, &c. He might add that the directors thought it their duty, considering the labours undertaken by the managing director and Mr. Cunningham (secretary) in the matter of the recovery of the money alluded to, to give them a substantial recognition out of the funds of the company. So they would allot to Major Wood £1,500 and to Mr. Cunningham £750. Under the articles of association the Board had power to make such awards, but they thought it best first to frankly consult the shareholders.

The Chairman here put the proposition for the adoption of the report and accounts, which was carried.

The retiring directors, Mr. W. S. Andrews and Major Wood, were then duly re-elected, as was also Mr. Weise, the auditor, on the proposition of Mr. Robinson Kendall. Mr. Kendall added that he was pleased the directors had paid such a compliment to Major

Wood and Mr. Cunningham. He felt sure that but for their very arduous labours it was very much to be questioned whether the company would have recovered any money at all. Their award was well deserved.

Mr. Pike most heartily endorsed the proposition to reward Mr. Wood and Mr. Cunningham, by whose exertions the astounding sum of £146,000 had been added to the coffers of the company. There was, however, one set of gentlemen who had done much in this matter, but whose names in that connection had not come before the meeting yet. He referred to their directors, who had served them well in not pulling the cords too tightly, and so not recovering any money at all. He would move that at the next meeting the directors be asked to accept between them 700 of the recovered shares, to be divided as they themselves thought best, as a reward for their services.

Mr. Sutton seconded the proposition; and Sir Wm. Andrews also expressed his concurrence.

Mr. Robinson Kendall raised the question whether the proposition was not *ultra vires?* whether the shareholders could give away the money belonging to the company?

Captain Cotton suggested that the shareholders should "fork out," and not give away shares until they were a dividend-paying company. He would give 10 per cent. of his dividends so that the directors might each have a service of plate or something of that kind.

A Shareholder suggested that the absent shareholders should have an opportunity of expressing an opinion upon this matter at the next meeting.

In answer to a question, the Solicitor to the company said it was quite competent for the meeting to express its wish on this or any other point, and then if the resolution were carried it would be the duty of the directors to give notice of such resolution for the forthcoming meeting, that it might be properly passed.

Captain Cotton proposed that the meeting present the directors with a service of plate; that would be something for them to hand down to their descendants. The proposer of the resolution was very liberal in giving away money out of other people's pockets. He thought they should rather put their hands into their own pockets than into those of the absent shareholders.

Mr. Robinson Kendall thought it a very invidious discussion. He thought the proposition of Captain Cotton would not meet with the approval of the meeting. So far as he could see, it was the desire of that meeting to reward the directors in a substantial manner.

Mr. Pike then put his resolution, and it was decided by a show of hands that the matter come before the next meeting.

Capt. Cotton moved as an amendment that no shares be given away in the manner proposed until the company was a dividend-paying concern.

The meeting was constituted an extraordinary general gathering for the consideration of some special resolutions, the first of which was agreed to, on the proposition of the chairman seconded by Mr. Earle (one of the board), and was as follows:—1. That in pursuance of the provisions of "The Companies Acts, 1867 and 1877," the sum of £349,550 capital, lost or unrepresented by available assets, be written off the capital account, and that the conditions contained in the Memorandum of Association be modified by reducing the capital from £1,398,200, divided into 69,910 shares of £20 each, to £1,048,650, divided into 69,910 shares of £15 each.

The next resolution, proposed by the Chairman, was a suggestion, really made by numerous shareholders, for a division of the ordinary shares into preferred and deferred shares, which was not carried, only four voting in its favour.

The third resolution was one empowering the board to appoint a managing director, who shall not be liable to retire by rotation.

This was agreed to, on the motion of the Chairman, seconded by Mr. H. Weaver (one of the board).

The proceedings then concluded with the vote of thanks to the chairman and the board, proposed by Mr. Cape and seconded by Mr. Kendall.

The Devon and Cornwall Electric Light and Power Company (Limited).

AT noon on Wednesday an extraordinary general meeting of the shareholders of the above-named company was held at the Cannon Street Hotel, under the presidency of Mr. W. H. Owen, Chairman of the Company, for the purpose of considering what action should be taken upon the following resolution, which was proposed by the Chairman and seconded by Mr. Bragington:—"That in the interests of the large majority of the shareholders of this company the said company do, on the hearing of the petition of Henry Whorlow for the winding up of the company, consent to an order being made by the judge to whose court such petition is attached."

The Secretary (Mr. Frederick B. Lidstone) having read the notice convening the meeting,

The Chairman referred to the conclusion come to by the shareholders at a previous meeting, that all legal proceedings and all attempts to wind up the company should be opposed by the directors. The petition lodged by Mr. Whorlow contained, amongst other allegations, a statement to the effect that the prospectus of the company was incorrect in the matter of claiming the exclusive right to the Lane-Fox incandescent lamp. There were now 37 shareholders suing the company for the return of the money paid on their shares, and the directors considered it only right that the shareholders should be called together, as it would be very unfair for a petition of a shareholder to get back the whole of his money at the expense of the other shareholders, who would probably have to meet a further call on their shares, the company not having sufficient money to pay their claims. The directors were of opinion that it would be for the interest of the other shareholders who had hitherto refrained from taking legal proceedings, that an order on Mr. Whorlow's petition should be made, rather than that another petition should be presented, because they were advised that in the event of an order being made on Mr. Whorlow's petition, such order would take effect from the day on which such petition was presented, viz., November 1, and the proceedings by hostile shareholders having been commenced subsequently to that day, such shareholders would, in the distribution of the assets of the company, rank on an equal with those shareholders who had abstained from hostile action. If on the other hand Mr. Whorlow's petition was dismissed by the court, the opposing shareholders might obtain priority over other shareholders, and it would be obviously unfair that a large section of the shareholders should suffer by having to pay others in full. He therefore only regarded it as fair to the general body of the shareholders that he should propose the resolution set forth in the notice calling the meeting.

In reply to questions the Chairman said that the company had in hand between £4,300 and £4,400, and unpaid calls to the extent of £3,000. The number of shares allotted was 9,123, and the company had no liabilities.

Mr. G. Bragington remarked that in all honour and honesty the company should be wound up, so that an equal distribution of all the funds might be made amongst all the shareholders. If they had any claim against the Great Western Company for misrepresentations that was another matter, and he suggested that a small committee should be appointed in connection with the matter.

The Chairman, in reply to questions from Mr. Fewings as to the number of proxies received in favour of the resolution, said the proxies represented 603 votes, and the shareholders present 418 votes. The Chairman then invited questions from the meeting, upon which

Mr. Fewings said he entirely agreed with the resolution. He thought from the explanations contained in the circular that there were some points which would strike those who had considered them. The course to be taken was to prevent the dissentient shareholders from being transformed, as they would be if this petition were not assented to, into creditors of the company and become entitled to be paid their money in full. That would, of course, be disastrous upon the shareholders who had abstained from action, and who would probably have to pay a further call in order to discharge the claims of the petitioning shareholders. He wished to ask whether the chairman or directors had made inquiries, or taken counsel's opinion, as to who is responsible for the error as to Lane-Fox lamp? and if so he should be very glad to hear exactly what the position of the company was upon that point.

The Chairman: Is it desired that I should answer that question now?

Mr. Fewings said he was really the mouthpiece of several shareholders in that room.

The Chairman said that one of the first steps taken by the directors was to get counsel's opinion upon the state of things. Mr. Fewings would readily see that the present moment was not opportune for discussing who was liable for the mistake. He certainly, for himself, thought somebody was liable. The opinion given to the directors was a somewhat unsatisfactory one. It was given by Mr. Romer, Q.C., a leading counsel at the equity bar, who thought that as this was a mistake all round, it would be very difficult to make any one liable. That was the pith of his opinion, which was not, of course, expressed in so many words. He (the Chairman) did not agree with that opinion for one moment, and it would become the duty of the liquidator, if there were one appointed, to look into that matter.

Mr. Henry Maudslay (one of the directors) said there were 37 proxies, and 24 were present in person, making 61. There were 37 people suing, therefore the proprietors who had not attended, although one-third of the company, appeared to take no interest at all in the company. And if each one of the claiming shareholders could get his money returned in full, the directors would be left in a very serious and anomalous position, and would also be obliged to make another call upon all the shareholders in order to obtain a sufficient sum of money to be divided amongst those who had been litigious and uncomfortable. The chairman explained to the meeting on a former occasion the state of affairs, when they passed a resolution that the directors should be empowered to fight any action that took place in court in reference to these questions. The board had attended at the court and had been particular to see what was done in the matter. Mr. Owen had taken a personal, fatiguing, and onerous position, and had carried out the duty of looking to the interest of the shareholders very efficiently and thoroughly. The expenses at the Exeter office were kept down as much as possible, and the whole business had been conducted with a simple desire to serve those who were connected with the company. He was not an original director to that company, but he held 1,000 shares in it, and did not traffic in them. There was a gentleman present who seemed to think he had not made his connection with the Great Western Company plain to them on a previous occasion. He had an opportunity of selling his shares in that company at a premium, but had not done so. He retained his position as a director with the sanction of the shareholders, in order to put matters in such a position as to protect the interests of the shareholders in the affair. He thought the best possible way to get out of the trouble they were in was the course proposed by the resolution which had been proposed by the Chairman and seconded by Mr. Bragington, so that the directors had not wholly tried to lead the meeting. They were obliged to confess that an error had been made. It was made before the board had anything to do with the matter. This company, in common parlance, had been "sold," and not the Lane-Fox lamp. The best thing they could do now would be to ask the Great Western to be good enough to hand back their shares and take back the concession granted to the Devon and Cornwall. He asked that board to consider and be straightforward enough, seeing that they sold what they had not got to sell, to say whether they would not take it back again, and because they would not do so, that was one reason, besides a few others, why he left the board of the Great Western Company. At the meeting on the 16th of November some questions were asked regarding the finances in the hands of the company. They had now claims upon them for £8,167, and they had now unpaid calls for £3,000.

Mr. Bragington thought instead of rushing into expense in the matter it would be much wiser to adopt the course suggested by the resolution.

Mr. Parsons (representing the Great Western Company) said he should not vote either for or against the liquidation. He should leave it entirely in the hands of the shareholders, without any pressure on the part of the company.

Mr. Barnes expressed his confidence in the past working of the company; but he thought there was a very great error in judgment in not inquiring into this matter before.

Mr. Fewings referred to the clause in the agreement between this company and the Great Western Company, whereby this company bought the electrical rights, which stated that if the company came into liquidation the concessions should revert to the Great Western Company, and this should forego all claim to the return of the money. He would like to know whether, in assenting to Mr. Whorlow's petition, they would do as he had said.

The Chairman said that that agreement was made long before it was thought that such a state of things would be brought about as an error in the sale of the very thing which the Great Western thus gave this company. Besides that, there was this: it was all very well to say by winding up that this concession reverts. They had only to do one of two things, wind up or go on. What was the result if they went on? Why a further probable call, perhaps to the whole extent of the shares, on purpose to satisfy these shareholders. On the one hand you have got a concession worth nothing to you; on the other hand you have all the hostile shareholders.

Mr. Bragington said the grounds upon which action was taken in this matter by the shareholders seemed to make the Great Western Company the more liable.

Mr. Fewings: Have you had negotiations with the Great Western upon this particular subject? What is their feeling on the matter?

The Chairman: There was a communication made to them on the matter; it came to nothing. The Great Western repudiated all liability whatever.

Mr. Maudslay remarked that the directors would not undertake the great responsibility of winding up without consulting the shareholders, for even then they would only have anticipated the position at which they had arrived that day.

The Chairman then put the resolution to the meeting, which he declared carried *nem. con.*, there being 19 hands held up in its favour and none against.

In answer to questions from Mr. Fewings,

The solicitor to the company (Mr. Rylands) explained the course taken on the appointment of a liquidator. It was in the hands of the clerk of the court, and any conclusion as to the naming of a liquidator that this meeting might come to would be utterly worthless. A committee, if appointed, would be equally useless, and if they were appointed they would expect to be paid. The shareholders are all merged into the liquidator, although the committee would even represent the shareholders. In a compulsory winding up a committee was unheard of. At least he never heard of a committee being appointed and sanctioned by the court in the case of a compulsory winding up.

The Chairman: I was about to express my opinion that the court would not recognise a committee.

Mr. Mortimer thought an additional reason for not appointing a committee was the expense attending the act. He was sure, moreover, that the directors would give the liquidator every assistance or information he might require. He thought to appoint a checking committee or anything of the sort would be rather a slur on the directors.

The Chairman: I believe if a committee were appointed the liquidator would give them a very courteous hearing.

Mr. Bragington: I should not like the matter to be left in the hands of any one who would spend our money anyhow.

The Chairman said he was sure all the directors would give any assistance they could in elucidating facts. He confessed he held a very strong opinion as to the liability of some parties to this company.

Mr. Bragington said he would propose that Mr. Henry Maudslay be a member of the committee.

The Chairman said any court would be jealous of suggestions made by outside persons. It was the object of the board to support the petition.

Mr. Maudslay expressed his wish to see the directors righted in this matter. If he lost his shares entirely now, he should lose £2,500, and that in addition to what he had already lost.

Mr. Barnes thought the shareholders should leave their interests in this matter in the hands of the directors.

The Chairman thanked the shareholders for their confidence hitherto; and said he was extremely sorry that matters had come to their present position.

Mr. Mortimer moved a vote of thanks to the chairman and the directors, which was seconded by Mr. Henry Maudslay, who said he was sure if Mr. Owen had had ten times the money at stake in this company he could not have taken a greater interest in the affairs of the shareholders than he had.

Mr. Bragington wished to express his own personal regard for the manner in which the board had conducted the business of the company.

The Chairman: I assume that the shareholders give their assent to that vote, so I will not ask it—(applause). I beg again to thank you once more for your cordial expressions, and to bid you adieu as a body.

The proceedings then terminated.

Ferranti, Thompson and Ince (Limited).—Sir Charles Laurence Young, Bart., has joined the board of directors of this company.

Eastern Electric Light and Power.—Mr. W. Jackson has been appointed secretary to this company.

German Union Telegraph.—An interim dividend has been declared of 5s. 9d. per share, free of income-tax, payable on and after January 20th.

LATEST QUOTATIONS.

Authorised Issue.	Share.	Name.	Paid	Closing Quotations. Jan. 10	Business Done.
		ELECTRIC LIGHT.			
40,000	10	Anglo-American Brush Co.	5	7½- 7¾	7⅜.½.9/16.⅝ m.
		Do. Do.	10	12 - 15	14½.14 ac.
30,000	5	Australasian Electric Light, Power & Storage Co.	3	¾- 1¼	
24,900	10	British Insulite Co., Limited, "A" Shares	5	2 - 3	
30,000	5	Brush Electric Light & Power Co. (Scotland)	2½	½- 1	
25,000	5	Great Western Electric Light & Power Co.	2½	¼- ¾	
24,980	5	Hammond Electric Light & Power Supply Co.	2½	3 - 3½	
40,000	5	Indian & Oriental Electrical Storage Works Co.	2	¾- 1¼	
172,500	1	Maxim-Weston Electric Light and Power Co.	1	⅜- ⅝	
40,000	5	Pilsen-Joel & General Electric Light Co.	2	1 - 1½	
..	..	South African Brush Electric Light & Power Co.	2½	¾- 1¼	
100,000	5	Swan United Electric Light Co., Limited	2½	2¼- 2½	
		TELEGRAPHS.			
2,116,400*l.*	Stk.	Anglo-American, Limited	100	49- 50	
2,441,800*l.*	Stk.	Do. Preferred } Def'd. receiving no div. until	100	81 82	81⅜.¾.¼ m. 81½ ac.
2,441,800*l.*	Stk.	Do. Deferred } 6 p. c. has been paid to Pref.	100	18½- 19½	
130,000	10	Brazilian Submarine, Limited	10	11⅞- 12⅛	
16,000	10	Cuba, Limited	10	9¾- 10¼	10 m.
6,000	10	Do. 10 per cent. Preference	10	17 - 18	17⅜ m.
13,000	10	Direct Spanish, Limited	9	6½- 7	
6,000	10	Do. 10 per cent. Preference	10	16 - 17	16½ m.
65,000	20	Direct United States Cable, Limited, 1877	20	12 - 12¼	12⅜ ac.
100,000*l.*	100	Do. 6 per cent. Debenture, repayable 1884	100	100 -103	
380,000	10	Eastern, Limited	10	11 -11¼	11 1/16.¼.3/16.¼ m
70,000	10	Do. 6 per cent. Preference	10	13¼- 13¾	13¾ m.
232,000*l.*	100	Do. 6 do. Debentures, repayable Oct. 1883	100	100 -103	
200,000*l.*	100	Do. 5 do. do. Aug. 1887	100	102 -105	
200,000*l.*	100	Do. 5 do. do. Aug. 1899	100	105 -108	
199,750	10	Eastern Extension, Australasia & China, Limited	10	12 - 12¼	12 m.
320,000	100	Do. 6 p. c. Debentures, repayable Feb. 1891	100	109 -112	
500,000	100	Do. 5 p. c. (Australian Gov. Subsidy) Deb. 1900	100	104 -107	
140,000	100	Do. do. registered, repayable 1900	100	104 -107	
100,000*l.*	100	Do. 5 per cent. Debenture, 1890	100	102 -105	103 m.
254,300*l.*	100	Eastern and South African Limited 5 per cent. Mort. Deb. Registered redeemable 1 Jan. 1900	100	103 -106	103¾ m.
345,700*l.*	100	Do. do. do. To Bearer	100	103 -106	
22,050	10	German Union Telegraph and Trust, Limited	10	10¼- 10¾	10½ m.
163,390	10	Globe Telegraph and Trust, Limited	10	6½- 6¾	6⅝.½ m.
163,209	10	Do. 6 per cent. Preference	10	12 - 13	12¾.13 m.
125,000	10	Great Northern	10	12 -12¼	12⅛ m.
100,000*l.*	100	Do. 5 per cent. Debentures	100	100 -103	
31,200	10	India-Rubber, Gutta-Percha and Telegraph Works	10	29 - 30	
100,000	100	Do. 6 per cent. Debentures, 1886	100	100 -103	
17,000	25	Indo-European, Limited	25	32 - 33	
38,148	10	London Platino-Brazilian, Limited	10	4 - 4½	
12,000	10	Mediterranean Extension, Limited	10	1½- 2	1⅝ m.
8,200	10	Do. 8 per cent. Preference	10	6 - 8	
9,000	8	Reuter's, Limited	8	12 - 12½	
280,000	Stk.	Submarine	100	250 -255	
58,225	1	Do. Scrip	1	2¼- 2½	
4,200	Cert.	Submarine Cables Trust	100	105 -109	
37,350	12	Telegraph Construction and Maintenance	12	32 - 33	
150,000	100	Do. 6 per cent, Bonds, 1884	100	100 -103	
186,750	5	Do. 2nd Bonus Trust Cert.	5	1½- 1¾	
30,000	10	West Coast of America, Limited	10	4¾- 5¼	
150,000	100	Do. 8 per cent. Debentures	..	..	
69,910	20	Western and Brazilian, Limited	20	7¾- 8	7¾ m.
200,000*l.*	100	Do. 6 per cent. Debentures "A" 1910	100	104 -107	
2,500	100	Do. 6 p.c. Mort. Deb. series B of '80, red. Feb., 1910	100	98 -101	
1,500	$1,000	Western Union of U. S. 7 p.c. 1 Mort. (Building) Bds.	$1,000	122 -126	
1,030,000*l.*	100	Do. 6 per cent. Sterling Bonds	100	102 -105	103½ m.
88,321	10	West India and Panama, Limited	10	1¼- 1½	1 5/16 m.
34,563	10	Do. 6 per cent. 1st Preference	10	7 - 7½	7 m.
4,669	10	Do. 6 do. 2nd do.	10	5½- 6	
		TELEPHONES.			
154,165	1	Con. Telephone & Maintenance, Ld. Nos. 1 to 154,165	1	⅝- ⅞	
200,000	1	Oriental Telephone Co., Nos. 100,000 to 300,000	½	⅝- ⅞	
100,000	5	United Telephone Co.	5	10¾- 11¼	11 7/16.3/16.⅛

TRAFFIC RECEIPTS.

The Cuba Submarine Telegraph Company. The number of messages passing over the lines of this company during the month of December was 2,954, estimated to produce £2,800, against 2,672 messages, producing £2,741, in the corresponding month of last year. The September receipts, estimated at £2,250, realised £2,283.

The Direct Spanish Telegraph Company (Limited). The estimated traffic receipts for the month of December, 1882, were £1,346, as against £1,458 in the corresponding period of last year. (In December, 1881, Bilbao cable interrupted 15 days; in December, 1882, Barcelona cable interrupted 23 days.)

The Eastern Telegraph Company. The traffic receipts for the month of December, 1882, were £49,610, against £49,829, in the corresponding period of 1881.

The Eastern Extension Telegraph Company. The traffic receipts for the month of November, 1882, were £32,591, against £49,844 in the corresponding period of 1881.

The Great Northern Telegraph Company. The traffic receipts in December, 1882, were £17,640; from January 1st to December 31st, 1882, £241,360, and in the corresponding months of 1881, £234,850; and in 1880, £236,576.

The Western and Brazilian Telegraph Company (Limited). The traffic receipts for the week ending December 22nd, 1882, were £2,485, for the week ending December 29th, 1882, £2,036, and for the week ending January 5th, 1883, were £2,179 each after deducting the "fifth" of the gross receipts payable to the London Platino-Brazilian Telegraph Company (Limited).

The West India and Panama Telegraph Company. The estimated traffic receipts for the half-month ended December 31st are £2,080, as compared with £2,406 in the corresponding period of 1881.

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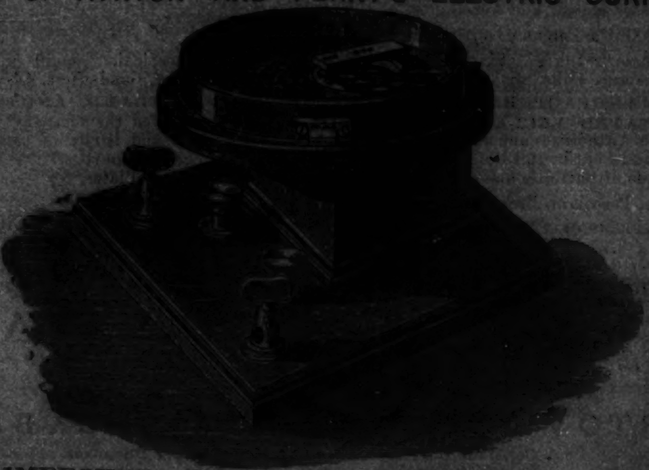

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